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ACHIEVEMENT IN THE JUNIOR HIGH SCHOOL

BY

BANCROFT BEATLEY

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PREFACE

FROM time to time since its inception, the junior high school has been the subject of attack by those who would eliminate the "fads and frills" of modern education in favor of a return to the fundamentals of reading, language, and arithmetic. Professional literature on junior high school education has repeatedly claimed that excessive amounts of time were spent on these fundamentals in the late elementary grades, and that the junior high school could effectively reduce the time devoted to fundamentals without sacrificing achievement. The present study was undertaken to test the validity of these claims.

In its initial stages, the study was a joint undertaking of the writer and Dr. Henry C. Mills, then a doctorate student in the Harvard Graduate School of Education, and now Assistant Professor of Education at the University of Buffalo. During the autumn of 1927, Dr. Mills examined approximately 2000 seventh-grade pupils and nearly 1200 ninth-grade pupils in non-junior and junior high schools in six Massachusetts cities. The data thus gathered formed the basis for his doctorate thesis entitled, *The Comparative Efficiency of the 8-4 and 6-3-3 Systems of Schools.* In the present study the records of nearly 1100 of the seventh-grade pupils tested by Dr. Mills have been used.

The writer acknowledges his indebtedness to Dr. Mills not only for his work in making available the cases on which this study is based, but also for his investigation of certain factors in the selected school systems.

The writer is further indebted to the school officers of *Nasonville, Jamesville, Nelson, Jenson, Nobleboro,* and *Jonesboro,* for their complete coöperation in the conduct of the study. Because of the nature of the comparisons, it was

agreed that the identity of these cities would not be disclosed.

Acknowledgment is also made of the generous financial support provided by the Harvard University Corporation through the Milton Fund for Research, and by the Harvard Graduate School of Education.

To his colleagues, Professors Truman L. Kelley and Francis T. Spaulding, the writer is grateful for valuable suggestions on various phases of the investigation.

BANCROFT BEATLEY.

Cambridge, April 1932.

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ACHIEVEMENT IN THE JUNIOR HIGH SCHOOL

CHAPTER I

THE NATURE OF THE STUDY

UNTIL relatively recent times, the prevailing type of organization of American secondary education was the four-year high school, enrolling pupils who had completed eight years in the elementary school. The past two decades have witnessed a widespread reorganization of the public-school system involving the establishment of the junior high school. This new unit, comprising the seventh and eighth grades of the traditional elementary school and the first year of the four-year high school, has been widely adopted, especially in the larger communities. It is probably not far from the truth to state that, at the present time, about half the school population in these grades is enrolled in some form of reorganized secondary school.

A proper understanding of the importance of the problem which is the concern of this investigation demands that the reader have some appreciation of the forces which brought the junior high school into being. These forces will be examined briefly to provide a setting for the problem.

One of the major social forces underlying the reorganization of secondary education was the demand on the part of the public that the secondary school be more readily accessible to American youth. Studies of the elimination of pupils from school by Thorndike, Ayres, and Strayer between 1905 and 1910 had shown that less than half the school population persisted to complete the eighth year of the elementary school and that of those who entered the four-year high school nearly half were eliminated prior to the beginning of the second year. These studies focused attention on the fact that the American high school of a generation ago was a highly selective institution serving primarily those pupils who planned to continue their education in some form of higher institution of learning.

Without minimizing the importance of providing suitable secondary education for the prospective college student, educational leaders urged that the secondary school should accept responsibility for contributing to American life by producing a higher level of developed intelligence in the majority of American citizens. The social force underlying this conception of the school's responsibility eventually expressed itself in the form of higher age-limits in state laws compelling school attendance, through a heightened demand for types of secondary education which were not exclusively academic, and in a rapid increase in enrollments in the upper grades and in the high school. The movement in the direction of universal secondary education has grown with accelerated pace especially since the conclusion of the World War. The American public has insisted upon more extensive educational opportunities for all children.

A second factor which led to the reorganization of secondary education was the growing recognition that the course of study in the traditional elementary school contained many elements which had outlived whatever usefulness they might have had in former times. Studies undertaken between 1910 and 1915 to determine the suitability of the content in the elementary-school curriculum led to the widely accepted conclusion that, if relatively worthless material were eliminated, the aims of that curriculum could be largely achieved by the time the pupil had completed the sixth grade. The time thus saved could be used to advantage through an earlier introduction of the content studies of the secondary school.

Increased recognition of the nature of individual differences in capacity, interest, and educational and vocational outlook also contributed to the development of the junior high school. Adequate provision for pupils of varying abilities demanded an earlier differentiation in the school program, which in turn necessitated a larger grouping of pupils in the seventh and eighth grades if such a program were to be economically administered.

These, then, were some of the forces which led to the establishment of a new unit in American education, the junior

high school. The grouping of the seventh, eighth, and ninth grades for this unit, though urged on educational grounds by the various national committees which considered the problem, has probably resulted more from the fact that this grade-grouping promised at least temporary relief from crowded conditions in the eight-year elementary school and the four-year high school. Whatever the cause, the fact remains that the reorganization has more frequently resulted in a grouping of the seventh, eighth, and ninth grades, than in any other form.

As the junior high school has developed, it has come to possess certain characteristics which stand in contrast to those of the traditional elementary school and the four-year high school. Some of these distinguishing features are: (1) a program of studies which reduces the allotments of time to reading, language, and arithmetic, thus permitting an emphasis on social studies, science, mathematics above the level of arithmetic, foreign languages, manual and domestic arts, fine arts and music, and physical education; (2) a gradual transition from the common curriculum of the elementary school to the specialized curricula of the senior high school; (3) a program of educational and vocational guidance; and (4) increased opportunities for social education through the organized life of the school.

Though the public has in general looked with favor upon the provision of opportunities for longer schooling for American youth, it has expressed apprehension with respect to the direction which these extended opportunities have taken. Among the criticisms to which the junior high school has been subjected is the commonly expressed claim that this school neglects the fundamentals and wastes public funds on "fads and frills." If this claim be true, it represents a serious indictment of the junior high school. In the interest of providing a program that will enable the pupil to interpret, to appreciate, and to participate more effectively in American life, the junior high school may in reality have hampered the pupil's adjustment to adult life through inadequate attention to the tools of communication and quantitative thinking. Here is an issue which is highly important in de-

termining the future course of junior high schools. Irrespective of the merits of the claims of educational leaders as to the value of the elements introduced to enrich the education of junior high school pupils, it is vital to learn whether the reorganized school provides for growth in the fundamentals of education less effectively than the traditionally organized school.

The study reported in this volume attempts to determine the validity of the claim that the achievements of pupils in reading, language, and arithmetic have suffered as a result of the lessened attention accorded these studies in the junior high school. Such studies of this problem as have been reported tend to cast doubt on the wisdom of reducing the time allotted to the fundamentals in the junior high school, but for reasons which will appear in the discussion of these previous studies in Chapter II, the findings are not completely convincing. The present investigation has attempted to attack the problem anew under conditions better calculated to yield a valid result.

The study involves a comparison of growth in achievement in reading, language, arithmetic, and certain aspects of science and the social studies from the seventh to the ninth grade in six Massachusetts school systems. Three of these systems have been reorganized on the 6-3-3 plan; the other three systems retained the 8-4 plan. Each junior high school system has been paired with a non-junior system. Within the paired systems, pupils were paired on the basis of sex, chronological age, intelligence quotient, and educational age at the beginning of the seventh grade. These same pupils were examined again near the close of their ninth-grade year. Their relative growth in achievement in fundamentals from the seventh to the ninth grades provides the basis for such conclusions as the study reaches.

The factors which were considered in selecting the communities for this study are presented in Chapter III. The detailed procedure of the investigation and the statistical methods for treating the data are the subjects of Chapters IV and V. The remainder of the volume is devoted to the presentation of the findings and their interpretation.

This study makes no attempt to pass judgment on the achievements of junior high school education as a whole. It will be shown that the junior high school systems in which the investigation was carried forward were typical junior high schools in the sense that they exhibited characteristics commonly found in reorganized schools but not commonly associated with unreorganized schools. Yet this study provides no measures of achievement in courses other than the so-called fundamental studies. One may only speculate, then, with respect to the gains in achievement which these newer elements in the program of studies produce. Nor does the study attempt to appraise the relative achievements of junior and non-junior schools in social attitudes, however fundamental these may be in education at this level. The only conclusions with respect to achievement which this study is justified in drawing are those which can appropriately be made on the basis of results of achievement tests in certain aspects of reading, language, arithmetic, science, and social studies. For convenience these aspects of education will be referred to as "fundamentals."

CHAPTER II

PREVIOUS INVESTIGATIONS

STATISTICAL studies of the problem of relative achievement in non-junior and junior high schools have been undertaken by William A. Porter, J. Orin Powers, F. C. Landsittel, and Henry C. Mills. This chapter will present the results of their studies with comments on their procedure.

The Porter Study.—Porter[1] investigated scholastic achievements in non-junior and junior high schools in the Minneapolis school system, which at that time was gradually being reorganized. In his study Porter used two procedures: (1) a comparison of achievements of paired pupils in the seventh and eighth grades; and (2) a comparison of marks of paired pupils in the senior high school.

The method of Part I consisted in pairing a junior high school pupil with a non-junior high school pupil of the same sex, grade, mental age, and intelligence quotient. The *Terman Group Test of Mental Ability* was used in determining mental age and intelligence quotient. One hundred such pairs were obtained in Grade 7A and another one hundred pairs in Grade 8A. The paired groups exhibited similar racial, social, and economic backgrounds. Achievement was measured by means of a battery of tests comprising the *Thorndike-McCall Reading Scale*; a section of the *Alpha Spelling Scale*; the *Buckingham Arithmetic Problems Test*; the *Woody Multiplication Scale*; the *Posey-Van Wagenen Geography Scales, Thought and Information*; and the *Van Wagenen American History Scales, Thought and Information.*

Porter compared the median achievements and median achievement quotients of the paired groups. The differences

[1]Porter, W. A., *A Comparative Study of the Scholastic Achievements Made by Junior and Non-Junior High-School Pupils in Minneapolis, Minnesota.* Unpublished Master's Thesis, University of Minnesota, 1924.

found were small, but with one exception—arithmetic problems in Grade 7A—these differences all favored the non-junior high school groups. From the data supplied by Porter, measures of the reliability of the differences were computed. In the case of the Grade 7A groups, the chances are better than 90 out of 100 that the non-junior group is in truth superior in achievement to the junior-high group in all of the elements tested except arithmetic problems. In the Grade 8A groups, each of the differences is such that chances are better than 99 out of 100 that the true difference favors the non-junior group.

In Part II of his study, Porter compared the marks given by senior high school teachers in the North High School, Minneapolis, to two groups of 100 pupils each. One group was composed of pupils who had entered the school from junior high schools, the other from non-junior schools. The basis of comparison was final marks in Grades 10 and 11 in English, mathematics, history, foreign language, and science. With the exception of tenth-grade Latin, in which there was a marked superiority for the non-junior group, the differences were small and unimportant.

The results of Porter's study are somewhat equivocal. His findings in the seventh and eighth grades lead to the conclusion that greater gains in achievement are made in the non-junior schools, yet his findings in the senior high school suggest that these greater gains, if established, are not important in conditioning the pupil's record in his subsequent education. Since the factor of intelligence was not controlled in the study of senior high school marks and since less reliable measures of achievement were employed in this phase of the study, the results in the seventh and eighth grades should probably be accorded greater weight.

From the standpoint of the problem as attacked in the present study, Porter's investigation yields little of importance for at least two reasons. In the first place, Porter measured his differences within a school system which was in process of reorganization from the traditional form to the junior high school plan. Since the graduates of both types of school entered the senior high schools of Minneapolis on

an equal footing, nearly the same type of education needed to be provided in both non-junior and junior high schools. This fact is apparent in the programs of studies of the two types of school and in the organization of instruction. With the exception of a slightly greater time-allotment to reading in the non-junior schools, the programs are similar. Furthermore, instruction in the seventh and eighth grades of the non-junior schools was organized on a departmental basis. Promotion by subject had supplanted promotion by grade in these schools. The results of the Porter study should be interpreted, therefore, as measuring two types of school of differing grade-organization but of similar instructional aims.

Another element in Porter's investigation which limits its significance, concerns the method of determining the groups in which the differences were studied. The eighth-grade groups were composed of different pupils from the seventh-grade groups. The findings are reliable only if it is valid to assume that the achievements of the paired groups of eighth-grade pupils would be the same as the achievements of the seventh-grade groups one year later when the latter groups would have completed the eighth grade. Porter's method of using different groups in the seventh and eighth grades paired on the basis of intelligence scores makes this assumption questionable in so far as intelligence scores are influenced by schooling.

The assumption which Porter made in his method of pairing appeared to be legitimate at the time of his investigation. More recently, however, Kelley has shown "that some 90 per cent of a general intelligence test and an all-round achievement test measure the same thing."[1] If Kelley's conclusion is sound, it might be said that Porter has equated his eighth-grade groups on the basis of school achievement (by means of a group test of intelligence) and has proceeded, through the use of other tests of achievement, to demonstrate that the pairing was in error. Nevertheless, Porter appears to have been the first investigator to attack

[1]Kelley, T. L., *Interpretation of Educational Measurements.* World Book Company, 1927, p. 193.

the problem of achievement in non-junior and junior high schools. His study is a careful piece of work carried out under conditions not calculated to produce a highly significant result. Porter himself was well aware of some of these limiting conditions.

The Powers Study.—As in the case of the study just reviewed, Powers[1] carried on his investigation in the schools of Minneapolis during the period of reorganization. Powers analyzed the results of achievement and intelligence tests administered by the Bureau of Research of the Minneapolis Public Schools in the seventh and eighth grades of both non-junior and junior high schools. The achievement tests used were: the *Thorndike-McCall Reading Scale;* the *Courtis Standard Research Tests in Arithmetic;* the *Buckingham Scale for Problems in Arithmetic;* the *Posey-Van Wagenen Geography Scales, Thought and Information;* and the *Gregory Tests in American History.* Intelligence ratings were secured through the use of the *Terman Group Test of Mental Ability.*

Powers made comparisons between the median achievement of non-junior and junior high school pupils for each of the achievement tests. He found that the achievements of non-junior pupils were higher than those of junior high school pupils in all of the subjects tested. On the *Thorndike-McCall Reading Scale,* the critical ratios (i.e., the difference between medians divided by the standard error of the difference) were 8.9, 13.5, 6.2, and 2.7 for Grades 7B, 7A, 8B, and 8A, respectively. On the *Gregory Tests in American History,* the critical ratio was 8.2 in Grade 8A. With one exception these critical ratios are so large as to substantiate the conclusion of superiority in achievement of non-junior pupils in the groups tested. The results obtained by Powers on the arithmetic and geography tests were such that the significance of the differences could not be tested. Powers points out that in these cases many pupils received zero scores and hence were not properly tested by the examinations selected. An inspection of the median differences

[1]Powers, J. O., *The Junior High School: A Study of Instructional Results in a Typical City System.* University of Minnesota Press, 1927.

in the arithmetic and geography scores suggests, however, that the non-junior pupils were superior also in these studies.

All of the foregoing comparisons were made solely on the basis of the pupil-performances on the tests administered in the seventh and eighth grades. When Powers examined the scores on the intelligence tests, he found a parallel superiority on the part of the non-junior pupils. Through the use of the achievement-quotient technique, he studied his groups again and discovered "that the achievements of the non-junior group, when related to mental levels, did not exceed the junior high school group."[1] Further investigation revealed that retention in the junior high schools was higher than in non-junior schools, and that the rate of promotion was more rapid in the junior high schools. These facts might account, in part at least, for the superiority of the non-junior pupils in achievement and intelligence.

From the standpoint of the problem of the present study, the Powers investigation possesses the same limitation as the Porter study in that both investigations were conducted within a single school system wherein grade organization, rather than educational program, was the variable under scrutiny. Powers directs attention to this fact in discussing his findings:

> Reorganization in the external features of the school as concerns junior high school grades without specific reorganization of the content of courses and of methods will not result in material differences in the outcomes of instruction in academic subjects. Efforts of the writer, not reported in this study, to discover any differences in the course of study or significant differences in methods of adaptation to pupil needs gave negative results.[2]

The Landsittel Study.—Another investigation which throws some light on the problem of relative achievement in non-junior and junior high schools was undertaken by Landsittel[3] at Ohio State University. Landsittel selected from among the freshmen at that institution two groups, one of

[1]Powers, *op. cit.*, p. 31.

[2]*Ibid.* p. 110.

[3]Landsittel, F. C., "Scholastic Accomplishment in the Junior High School," *Journal of Educational Research*, 18: 127-135, September, 1928.

which was composed of students whose education in Grades 7 to 9 had been gained in junior high schools, the other of which included only students whose education at this period had been gained in non-junior schools. The groups were paired on the basis of scores on psychological tests administered at the time of entrance to the university. The method of pairing also took into account the size and type of community in which the pupil had received his previous education.

Landsittel compared the scholastic accomplishments of these two groups in science, mathematics, and foreign languages both in the senior high school and in the winter quarter of the freshman year of college. His groups varied in size from 63 pairs in mathematics to 129 pairs in science. Marks in courses were used as the measures of achievement.

The results secured by Landsittel indicated for the groups studied a superior scholastic accomplishment for the non-junior students. The critical ratios (difference in means divided by the standard error of the difference) obtained in his six comparisons were 0.74, 1.57, 0.87, 0.96, 0.64, and 0.74. These findings led Landsittel to conclude that "the general showing is not to the credit of the junior high school; every really significant difference is against it."[1] While no one of the critical ratios is large enough to justify Landsittel's conclusion, the fact that all six differences favored the non-junior groups lends strong support to his inference.

As in the case of the Porter study, the method of procedure used by Landsittel is perhaps open to the criticism that his pairing was on the basis of psychological scores which are themselves capable of interpretation as measures of achievement. This criticism would not be applicable in the case of the comparison in college achievement, since the marks given in courses were obtained subsequent to the psychological scores. Nor would the criticism have the same force as in the Porter study because the percentage of overlapping of intelligence scores and marks of achievement in secondary-school science, mathematics, and foreign language is not known.

[1]Landsittel, *op. cit.*, p. 134.

Another source of unreliability in Landsittel's study is found in the fact that chronological age was not kept constant. The mean chronological age of the non-junior groups was one half a year higher than that of the junior high school groups in three out of the four paired groups, and two tenths of a year higher in the fourth. In the only distribution of chronological ages of paired groups which Landsittel publishes, this difference in maturity as measured by age is very pronounced. The junior high school group ranges in age (as college freshmen) from fifteen to twenty-one; the non-junior group from sixteen to twenty-seven. Of one hundred twenty-nine cases in each group, seven of the junior high school group are younger than seventeen years of age; in the non-junior group only two are younger than seventeen years. Six of the junior group were twenty-one years old, while fourteen of the non-junior group were from twenty-one to twenty-seven years old. Since the differences in achievement involved in a study of this sort are necessarily small, it would seem that a closer control over such a factor as chronological age should have been effected if the findings of the study are to be accepted. On the other hand, if the junior high school organization is committed to the policy of reducing failures, the effect of the resulting increase in the average rate of promotion should perhaps not be eliminated by a closer pairing with respect to chronological age.

From the standpoint of the present investigation, Landsittel's findings, if worthy of acceptance, are significant only for that group of pupils in Grades 7 to 9 who will continue their education beyond the secondary school.

The Mills Study.—In his investigation of the relative achievement of non-junior and junior high school pupils, Mills[1] selected for his comparison six Massachusetts school systems, three of which were chosen as typical of the traditional organization and the remaining three as representative of the junior high school organization. Each community was

[1]Mills, H. C., *The Comparative Efficiency of the 8-4 and 6-3-3 Systems of Schools.* Unpublished Doctorate Thesis, Graduate School of Education, Harvard University, 1931.

paired with another community of nearly the same size and type, the important variable being the form of school organization. Mills shows that in his paired school systems, the junior high school members devote markedly less time to the fundamentals not only in the seventh and eighth grades but in the first six grades as well. The *Otis Self-Administering Tests of Mental Ability (Intermediate Examination)* and the *Stanford Achievement Test* were given to about 3200 pupils in the seventh and ninth grades in November and December, 1927. The results which Mills reported were based on 1726 cases in Grade 7 and 1183 cases in Grade 9.

In his comparisons of achievement at the beginning of the seventh grade, Mills found that junior high school pupils exhibited substantially the same proficiency in fundamentals as non-junior pupils. Mills found differences in achievement between the members of his paired systems, but they were not maintained consistently by either type of school organization. In his ninth-grade comparison, the same finding was obtained, with the exception that the non-junior pupils were in all three instances notably superior to the junior high school pupils in spelling achievement.

In interpreting the results of his investigation, Mills states that

> . . . to the extent that a criterion of efficiency is to be found in equal proficiency in the fundamental subjects secured with a smaller expenditure of time, the six-three-three schools included in this study must be considered during the seventh and eighth grades as more efficient than the eight-four systems with which they are paired. As far as can be judged from the test of intelligence used and the age of the pupils involved, there is nothing to suggest that the former schools are able to secure this more efficient performance through the happy chance of enrolling pupils who are more capable than those attending the eight-four organizations. Some factor operative during the seventh and eighth grades—type of instruction, curriculum reorganization, ability grouping, supervised study, or some such item—have enabled them to surround the pupil with a more efficient educative environment and to secure an equal degree of proficiency in the "fundamentals" with less than the amount of time required in the eight-four schools. Irrespective of the use which is

made of this saved time, the junior high school systems are seen in a more favorable light than their eight-four fellows.[1]

From the point of view of method the Mills study is superior to any of the previous investigations. It possesses an advantage over the Porter and Powers investigations in that the school systems which were used exhibited differences in time-allotments according to their type. Furthermore, the comparisons in achievement included a span of two years from the beginning of the seventh to the beginning of the ninth grade as contrasted with a one-year span in the studies by Porter and Powers. The Mills investigation thus seems to present a more reliable picture of what happens to growth in the fundamentals during the junior high school period.

A limitation of the Mills study is revealed in the assumption that the achievement of his ninth-grade group is the same as that which the seventh-grade group would have secured had the latter group been tested two years later. Since Mills showed that his junior high school systems exhibited a somewhat higher rate of promotion and a slightly lower rate of elimination, this assumption is not strictly tenable—a fact which should be borne in mind in interpreting the conclusions of his study.

With the exception of the Mills study, the results of previous investigations have tended to support the conclusion that non-junior pupils exhibit higher levels of achievement in fundamentals than junior high school pupils. An examination of the methods by which this conclusion has been reached, however, leaves room for doubt as to its validity.

[1]Mills, *op. cit.*, pp. 217-18.

CHAPTER III

CHARACTERISTICS OF THE SELECTED SCHOOL SYSTEMS

IN THE present investigation, the relative gain in achievement from the seventh grade through the ninth grade was examined in three pairs of Massachusetts school systems. One member of each pair was a system organized on the 6-3-3 plan; the other member of the pair was an 8-4 system. Since no two school systems could ever be found in which the form of organization would be the only variable, it was deemed necessary to conduct the investigation in more than one pair of systems. Results which would answer the problem conclusively would have to be obtained through an examination of many pairs of school systems of varying size, type, and geographical location. Owing to lack of funds and the organization necessary for carrying on a more elaborate study, however, this investigation was limited to three such pairs.

The Selected Systems.—In choosing the communities in which the investigation was to be conducted, the attempt was made to pair systems of about the same size and type. The non-junior system in each pair should be fairly typical of schools organized on the 8-4 plan; the junior high school system in each pair should be typical of the 6-3-3 organization. Since the investigation is concerned with relative gains in achievement between schools which provide different emphases on fundamentals in their programs of study, the communities were selected with this point in mind. In this chapter certain characteristics of the paired systems will be presented. These characteristics include both those factors which were controlled and other factors not controlled.

In seeking the coöperation of the six school systems which participated in this investigation, it was agreed not to disclose their identity. Hence, fictitious names have been used

in referring to these communities. Names have been selected which will enable the reader to follow the discussion more readily. These names are:

Nasonville	paired with	Jamesville
Nelson	paired with	Jenson
Nobleboro	paired with	Jonesboro

The first letter in the name indicates whether the community has a non-junior or a junior high school system. The second letter in the name indicates the relative size of the system: *a* is used for the largest system within the classification; *e* for the second largest; and *o* for the smallest. The members of a pair may also be readily identified by the likeness of the final syllables.

Nasonville and Jamesville are both located in a metropolitan area. Nasonville has a somewhat larger population than Jamesville, but both are in the 100,000 group. Each community is largely residential, with populations of varying racial and economic backgrounds. Certain sections of both communities are devoted to industrial activities, Nasonville having in proportion to its size a larger amount of such activity.

Nelson and Jenson are industrial communities in the 40,000 population group. Both communities have mixed populations from the standpoint of racial, social, and economic background. Jenson is on the fringe of a large metropolitan area, while Nelson is an important commercial center in an area adjacent to the same metropolitan district. Jenson has the larger proportion of commuters.

Nobleboro and Jonesboro are smaller industrial communities of about 20,000 inhabitants. Each has a large proportion of pupils of foreign-born parentage in its schools. In recent years, these communities have tended to become more largely residential in character. In its industrial activity, Nobleboro exhibits diversified interests, while Jonesboro is a single-industry town. These communities are about equally distant from a large metropolitan center.

From the point of view of size and type of community, the pairing appears to be reasonably adequate. In certain

other particulars such as wealth, school support, pupil-teacher ratio, and teachers' salary levels, the pairing is less satisfactory. The facts with respect to these characteristics are presented below.

TABLE 1

SHOWING FOR THE SCHOOL YEAR 1928-29 CERTAIN FACTS CONCERNING THE SELECTED SCHOOL SYSTEMS*

	Nasonville	Jamesville	Nelson	Jenson	Nobleboro	Jonesboro
Population Group (Mass. 1925 Census)	100,000	100,000	40,000	40,000	20,000	20,000
Average Pupil-Membership in All Public Day Schools	15,600	15,200	5,200	6,100	3,600	4,300
Valuation per Pupil in Net Average Membership	$12,200	$8,000	$7,100	$11,200	$5,700	$8,100
Rate of Total Tax per $1,000 Valuation, 1928	$31.40	$28.40	$35.60	$31.00	$34.40	$29.00
Expenditure per Pupil in Net Average Membership	$118	$81	$103	$96	$73	$84
Pupil-Teacher Ratio in All Public Day Schools	25	32	20	29	33	28
Average Teacher-Salary in All Public Day Schools	$2,030	$2,110	$1,530	$1,830	$1,720	$1,560

*Data for this table were obtained from the *Annual Report of the Department of Education, Commonwealth of Massachusetts*, Volume 93, Part II, 1929.

In directing attention to these facts, it is assumed that, other things being equal, the greater the wealth of a community, the greater the financial support which it provides for public education, the higher the salaries paid to teachers, and the lower the pupil-teacher ratio, the greater will be the

educational achievements of the school population. Of these assumptions the one most subject to question is that concerning the pupil-teacher ratio. Differences in this pupil-teacher ratio may be caused by either or both of two other factors; size of class and teaching load. Investigations of size of class in relation to teaching efficiency have tended to show that on the whole large classes are not inferior to small classes in so far as measurable achievement is concerned.[1] Since, for a number of reasons, the results of these investigations are not completely convincing, and since little is known with respect to the influence of teaching load on achievement, the facts with respect to pupil-teacher ratio are presented as having a possible bearing on achievement.

An examination of the direction in which these uncontrolled factors would probably operate in the present study indicates that no one factor consistently favors the junior high school system or the non-junior school system. In six instances the junior high school has the advantage, and in the remaining six the non-junior school is favored.

TABLE 2

SHOWING FOR EACH OF FOUR UNCONTROLLED FACTORS THE DIRECTION IN WHICH THE FACTORS WOULD TEND TO OPERATE TO INVALIDATE CONCLUSIONS FROM THE INVESTIGATION

	Nasonville-Jamesville	Nelson-Jenson	Nobleboro-Jonesboro
Valuation per Pupil	Non-junior	Junior	Junior
Expenditure per Pupil	Non-junior	Non-junior	Junior
Pupil-Teacher Ratio	Non-junior	Non-junior	Junior
Average Teacher Salary	Junior	Junior	Non-junior

Some other uncontrolled factors which might tend to invalidate the comparisons between paired school systems are (1) differences in the quality of the professional leadership; (2) differences in the professional competence of the teaching staff; (3) differences in standards of promotion; (4) differences in the adequacy of buildings and equipment. Since

[1]For an excellent summary of investigations on this problem, see Hudelson, E., *Class Size at the College Level.* The University of Minnesota Press, 1928.

these factors do not lend themselves readily to objective determination, it has been assumed in this study that, like the factors already presented, they would probably not operate consistently to favor one type of school organization rather than the other. This assumption is perhaps not warranted in view of the likelihood of a positive correlation between the quality of professional leadership and the professional competence of the teaching staff, yet it is the best assumption which can be made under the circumstances.

It has been shown, then, that the communities which were selected for pairing on the basis of comparable size and type exhibit certain differences, some if not all of which are likely to have influenced educational achievement, but not consistently so as to favor one type of organization rather than the other.

Junior High Schools in the Selected Systems.—At the time this study was initiated, November, 1927, the three junior high school systems had been operating on the junior high school plan for at least five years. Jamesville was one of the first communities in Massachusetts to adopt this form of organization. In 1914, Jamesville organized one school as an experimental junior high school and in 1915 adopted the plan for the entire system. Jenson reorganized its schools on the 6-3-3 plan in 1920, while Jonesboro inaugurated a 6-2-4 system in 1921 and established the 6-3-3 plan in 1922. It is of interest to note that subsequent to completing the gathering of data for this study, Nobleboro has reorganized its schools on the 6-3-3 basis.

In selecting the junior high schools of Jamesville, Jenson, and Jonesboro as representative of the junior high school movement, and in pairing these school systems with those of Nasonville, Nelson, and Nobleboro, these criteria were used:

1. Does the junior high school include Grade 7 to Grade 9?
2. Does the junior high school have a teaching staff that devotes itself exclusively to these grades?
3. Does the program of studies of the junior high school exhibit
   a. Reduced time-allotments to fundamentals?

b. General introductory courses such as general mathematics, general science, junior business training, and the like?
c. Opportunities for exploratory work in such fields as foreign language, practical arts, and the fine arts?
d. Provision for gradual introduction of elective studies?

All of the junior high school systems and none of the non-junior systems included in this study met the first and second of these criteria: organization of grades, and separate teaching staff. Since the findings of the investigation hinge upon differences in the program of studies of junior and non-junior schools, facts justifying the selection of the school systems from the standpoint of this third criterion will be presented in some detail.

Time-Allotments in the Programs of Study.—In establishing the fact of difference in time-allotments between the members of the paired school systems, the ninth school grade has not been included. This grade is omitted because in both junior and non-junior systems the programs of study are similar in that English is the only study universally prescribed and that all other subjects with the exception of music and drawing are organized on the unit basis. In presenting time-allotments in the seventh and eighth grades, the fields of English, mathematics, social studies, and science have been treated separately because these are the fields in which achievement was tested in the present investigation.

A comparison of time-allotments in the seventh and eighth grades of the Nasonville and Jamesville schools is presented in Table 3.

TABLE 3

SHOWING IN MINUTES PER WEEK THE AMOUNTS OF TIME DEVOTED TO VARIOUS SUBJECTS IN THE PROGRAMS OF STUDY FOR GRADES 7 AND 8 IN NASONVILLE AND JAMESVILLE

Subject	Grade 7		Grade 8		Grades 7–8	
	Nasonville	Jamesville	Nasonville	Jamesville	Nasonville	Jamesville
English		180		180		360
Reading	100		100		200	
Composition	120		120		240	
Grammar	80		80		160	
Spelling	75	60	75	60	150	120
Penmanship	60	60	60	60	120	120
English Total	435	300	435	300	870	600
Mathematics						
Arithmetic	160	180	160	180	320	360
Mathematics Total	160	180	160	180	320	360
Social Studies						
Geography	120		120		240	
History and Civics	160		160		320	
History and Geography		180		180		360
Social Studies Total	280	180	280	180	560	360
Science						
Elementary	60		60		120	
Physiology and Nature Study	30		30		60	
Hygiene		60		60		120
Science Total	90	60	90	60	180	120
Other Studies*						
Music	75	60	75	60	150	120
Drawing	80	60	80	60	160	120
Practical Arts	90	120	90	120	180	240
Latin						
French						
German						
Spanish		240		240		480
Introductory Business						
Domestic Arts (Special)						
Other Studies Total	245	480	245	480	490	960
Total	1210	1200	1210	1200	2420	2400

*Not including physical education, extra-curricular activities, assembly periods, study periods.

An examination of this table reveals these important facts:

1. Nasonville devotes nearly 50 per cent more time than Jamesville to the various aspects of English.
2. Jamesville, on the other hand, spends more than 10 per cent more time on arithmetic.
3. Nasonville consistently assigns about 50 per cent more time to both social studies and science than Jamesville.
4. Jamesville, through reduced time-allotments to English, social studies, and science, is able to devote approximately twice as much time to studies other than the fundamentals.

If it were not for this last fact, Jamesville would perhaps be an undesirable representative of the junior high school in this investigation. Like Nasonville, Jamesville makes no distinction between Grades 7 and 8 in the amounts of time assigned to fundamentals. In this, the Jamesville system is not representative of junior high school systems. Furthermore, Jamesville has not reorganized its instruction in mathematics and science so as to provide general introductory courses in these fields. Yet the Jamesville program is typical of junior high schools in its provision of exploratory courses in certain fields and in its reduced time-allotments to fundamentals.

In Table 4, the time-allotments in the programs of study of Grade 7 and Grade 8 of the Nelson and Jenson schools are presented.

This table reveals these facts:

1. In Nelson, more than twice as much time is assigned to the elements of English as in Jenson.
2. In the two systems, the amounts of time devoted to mathematics are approximately equal in the seventh grade, though Nelson devotes 20 per cent more time to this field in the eighth grade.
3. No important difference is found in the time-allotments to social studies.
4. In science, Jenson allots three times as much time as Nelson.
5. Pupils in the seventh and eighth grades in Jenson junior high schools have twice as much time for studies other than the fundamentals.

TABLE 4

SHOWING IN MINUTES PER WEEK THE AMOUNTS OF TIME DEVOTED TO VARIOUS SUBJECTS IN THE PROGRAMS OF STUDY FOR GRADES 7 AND 8 IN NELSON AND JENSON

Subject	Grade 7		Grade 8		Grades 7–8	
	Nelson	Jenson	Nelson	Jenson	Nelson	Jenson
English		250		250		500
Reading and Literature	170		170		340	
Language and Composition	250		250		500	
Spelling	100		100		200	
Penmanship	60		60		120	
English Total	580	250	580	250	1160	500
Mathematics		250		200		450
Arithmetic	240		240		480	
Mathematics Total	240	250	240	200	480	450
Social Studies		250		250		500
Geography	120		120		240	
History	120		120		240	
Social Studies Total	240	250	240	250	480	500
Science		150		150		300
Hygiene	45		45		90	
Science Total	45	150	45	150	90	300
Other Studies*						
Music	75	100	60	50	135	150
Drawing	75	50	60	50	135	100
Sewing	60		60		120	
Practical Arts		100		100		200
Library		50		50		100
Introductory Foreign Language						
Junior Business				200		200
Practical Arts (Extra)						
Other Studies Total	210	300	180	450	390	750
Total	1315	1200	1285	1300	2600	2500

*Not including physical education, extra-curricular activities, assembly periods, study periods.

From the analysis, it appears, furthermore, that Jenson provides a better example of junior high school education than does Jamesville. Not only are the time-allotments to English and mathematics reduced, but these fields have been reorganized. In mathematics, while Nelson is devoting two more years to arithmetic, Jenson is presenting general mathematics which includes much content not tested by the arithmetic examinations in the *Stanford Achievement Test.* Again, the Jenson junior high schools have substituted social studies for history and geography, and general science for hygiene. While in some instances these changes in the titles of courses may serve merely to obscure the kind of content treated, in the case of the Jenson junior high schools it is true that these newer courses are richer in content than those provided in the Nelson schools. It is also true that these newer courses provide opportunities for pupil growth which are not subject to examination by the *Stanford Achievement Test.*

It has been shown earlier that Nelson and Jenson were not entirely satisfactory members of a pair because Nelson is urban while Jenson is suburban. From the standpoint of the programs of study in the seventh and eighth grades, however, Nelson and Jenson exhibit the widest differences of any of the three pairs of school systems employed in this study. For this reason, it was deemed desirable to pair Nelson and Jenson in spite of the fact that they were not in at least one respect similar communities.

The programs of Nobleboro and Jonesboro are analyzed from the point of view of time-allotments in Table 5.

TABLE 5

SHOWING IN MINUTES PER WEEK THE AMOUNTS OF TIME DEVOTED TO VARIOUS SUBJECTS IN THE PROGRAMS OF STUDY FOR GRADES 7 AND 8 IN NOBLEBORO AND JONESBORO

Subject	Grade 7		Grade 8		Grades 7–8	
	Nobleboro	Jonesboro	Nobleboro	Jonesboro	Nobleboro	Jonesboro
English		240		200		440
Reading and Literature	90		90		180	
Language and Composition	175		175		350	
Spelling	50	80	50		100	80
Penmanship	45		45		90	
English Total	360	320	360	200	720	520
Mathematics		200		160		
Arithmetic	250		250			
Mathematics Total	250	200	250	160	500	360
Social Studies		280		240		
Geography	100		100		200	
History and Civics	100		130		230	
Social Studies Total	200	280	230	240	430	520
Science		—		120		120
Elementary Science	30		—		30	
Science Total	30	—	—	120	30	120
Other Studies*						
Music	90		90		180	
Drawing	60		60		120	
Practical Arts	90	80	90	80	180	160
Fine Arts		160		160		320
Introductory Latin				120		120
Introductory French						
Junior Business						
Other Studies Total	240	240	240	360	480	600
Total	1080	1040	1080	1080	2160	2120

*Not including physical education, extra-curricular activities, assembly periods, study periods.

The comparison of time-allotments in the programs yields these differences:

1. Nobleboro devotes nearly 40 per cent more time to the elements of English than Jonesboro.
2. Nobleboro also assigns nearly 40 per cent more time to mathematics.
3. Jonesboro, on the other hand, allots 40 per cent more time to social studies.
4. Each community offers science in only one of these two grades—Nobleboro in Grade 7, and Jonesboro in Grade 8. Jonesboro devotes four times as much time to science as Nobleboro if the allotments in both seventh and eighth grades are considered.
5. Nobleboro and Jonesboro exhibit no difference in the time-allotments to "other studies" in the seventh grade. Jonesboro, however, assigns 50 per cent more time to these studies in the eighth grade.

The program of studies of the Jonesboro junior high schools is typical of junior high schools in general in that the mathematics, social studies, and science courses are of the orientation type. In English, Jonesboro continues to teach spelling and penmanship as distinct from other aspects of instruction in English language. From the standpoint of time-allotments in the programs of the seventh and eighth grades, however, Jonesboro and Nobleboro do not differ as widely as do the members of the other pairs.

The major facts with respect to time-allotments in the programs of study of the three pairs of school systems are summarized in Figure 1.

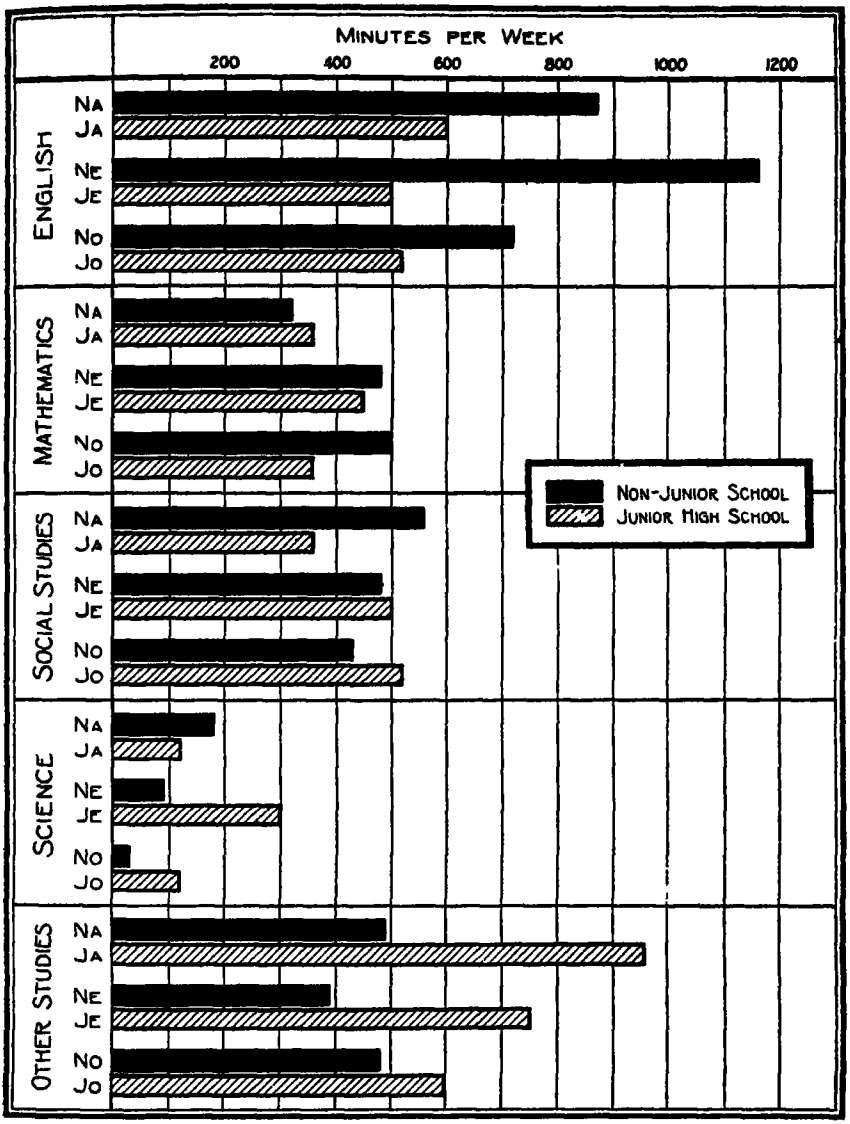

FIGURE 1. SHOWING THE AMOUNTS OF TIME ALLOTTED TO VARIOUS STUDIES IN THE SEVENTH AND EIGHTH GRADES OF THE PAIRED SCHOOL SYSTEMS.

In each pair, the junior high school member devotes less time to "fundamentals" than to "other studies." All of the non-junior schools assign more time to reading and language work. With the exception of the Nasonville-Jamesville pair, such time as is allotted to mathematics, social studies, and science is utilized to provide in part types of experience in learning, the products of which are not directly tested by the *Stanford Achievement Test.* Such differences in achievement as this investigation demonstrates between non-junior and junior high schools must therefore be interpreted in the light of the differences in the programs of study of the contrasted systems.

CHAPTER IV

THE TESTING PROGRAM

SELECTION OF TESTS.—The measure of general achievement used in this study was the *Stanford Achievement Test.* This test was selected because of the functions which it measures, the grade levels in which it is appropriate, and the high reliability which it possesses. The sub-tests of the *Stanford Achievement Test (Advanced Examination)* are

Test 1.	Paragraph Meaning	Reading
Test 2.	Sentence Meaning	
Test 3.	Word Meaning	
Test 4.	Arithmetic Computation	
Test 5.	Arithmetic: Reasoning	
Test 6.	Nature Study and Science	Information
Test 7.	History and Literature	
Test 8.	Language Usage	
Test 9.	Dictation (Spelling)	

This battery of tests measures achievement in "elementary school studies, except mechanical studies, home economics, art, music, and citizenship habits and attitudes."[1] The reliability of the educational ages gained in the cases of pupils from ten to fifteen years old is very high ($r=0.98$). Furthermore, nearly all of the reliability coefficients of the separate tests for these ages are above 0.80, while more than half of the coefficients are above 0.90.[2]

Although there are other tests which, in the measurement of a single function, *e.g.*, language usage, are perhaps superior to the corresponding sub-tests of the *Stanford Achievement Test,* the fact that these sub-tests were constructed as parts of a unified whole had great weight in determining its use in this study. The results gained

[1]Kelley, T. L., *Interpretation of Educational Measurements.* World Book Company, 1927, p. 303.

[2]Kelley, T. L., Ruch, G. M., and Terman, L. M., *Stanford Achievement Test,* Manual of Directions. World Book Company, 1923, pp. 15-16.

through the use of the *Stanford Achievement Test* have in most instances justified its selection.

The measure of general intelligence employed in this investigation was the *Otis Self-Administering Test of Mental Ability*. This test was selected because in a comparative study of nine group intelligence tests administered to seventh-grade pupils in junior high schools, Brooks[1] reported a correlation with a composite criterion of intelligence which was higher for the Otis test than for any of the other eight group tests. Brooks found further that in twenty-seven out of thirty-six combinations, I.Q.'s gained by the Otis test alone correlated with his criterion of intelligence better than did the average I.Q.'s obtained from two group tests of intelligence. In eight out of nine combinations, where higher correlations were obtained, the Otis test was one member of the pair. On the basis of these findings by Brooks, the Otis test was selected as the best single test for use in the seventh grade. This test was used as the sole measure of intelligence in the present study because its validity (r=0.89 in the Brooks study) and its reliability[2] (r=0.95) were deemed high enough to ensure reasonably successful pairing of pupils in I. Q., and because of the necessity for limiting the amount of time devoted to testing.

Seventh-Grade Testing.—The initial testing was undertaken by Dr. Henry C. Mills with the assistance of certain graduate students and teachers who were trained in the giving and scoring of tests. The *Stanford Achievement Test, Advanced Examination, Form A*, and the *Otis Self-Administering Test of Mental Ability, Intermediate Examination, Form A*, were administered to nearly 2000 seventh-grade pupils in the six school systems. In the interest of securing for each pair of systems paired groups containing at least 50 boys and 50 girls, a considerably larger number of

[1]Brooks, F. D., "The Accuracy of Intelligence Quotients from Pairs of Group Tests in the Junior High School," *Journal of Educational Psychology*, 18: 173-186, March, 1927.

[2]Otis, A. S., *Self-Administering Tests of Mental Ability*, Manual of Directions. World Book Company, 1922, p. 12.

seventh-grade pupils were tested in order to allow for elimination between the seventh and ninth grades. It was believed that if records were secured for from 300 to 400 seventh-grade pupils, a sufficient number of these would be present in the ninth grade to permit the securing of 100 cases suitable for building the paired groups. Since Jenson, Nobleboro, and Jonesboro each had fewer than 350 seventh-grade pupils, all of the pupils were tested in these systems. In Nasonville and Nelson a selection of elementary schools was made that would produce a group typical of seventh-grade pupils for these cities. In Jamesville, the seventh-grade population was sampled by selecting every fourth pupil in the register of each junior high school. The size of the samples in Nasonville and Jamesville was sufficient to make possible the use of 131 cases in building paired groups. In the remaining paired communities, even though all seventh-grade pupils were tested in three out of the four systems, it was impossible to secure from each school system the 100 cases desired, though 93 usable cases were obtained in both Nelson and Jenson, and 82 cases in Nobleboro and Jonesboro.

The tests were administered at two sittings on successive days during November and December, 1927. On the first day, the Otis test and Sub-Tests 1-3 of the Stanford examination were given. On the second day, the remaining Stanford tests were undertaken, a brief recess being permitted between Sub-Tests 5 and 6. All of the testing within a school system was carried on during the same week.

The seventh-grade tests were scored by the graduate students who assisted Dr. Mills. The scoring was checked by Dr. Mills, who re-scored the tests in cases where inaccuracies were discovered. The cases of individual pupils whose records were incomplete owing to absence on the second day of the testing or to failure to follow directions were eliminated. Dates of birth were obtained from the pupils on both the Otis and the Stanford tests. These dates were later checked against the school registers. A further check on chronological age was obtained through a similar procedure in subsequent testing in the ninth grade. The indi-

vidual records were entered upon cards in order to facilitate the later work of pairing.

Ninth-Grade Testing.—In March and April, 1930, the individuals previously tested who were still in school and who had made normal progress from Grade 7 to Grade 9 were re-tested. Since standards of promotion vary somewhat from one school system to another, an element of weakness in the procedure may have crept into the investigation at this point through the elimination of those still in school who had failed of promotion. Since the method used in the study involved an examination of relative gains of paired groups, it is believed that this variability in promotion standards has influenced the results only in so far as the more highly selected group exhibited greater persistence in school work. As comparable data concerning non-promotion and elimination in the six school systems were not available and as the importance of these factors in this study did not appear to be large, no analysis of the effects of non-promotion and elimination has been made. Since in the non-junior systems, the pupils who had been retarded were not present to be tested in the four-year high schools, it was thought desirable to eliminate from the study also the junior high school pupils who had failed of promotion to Grade 9, even though these pupils were still in school.

The ninth-grade pupils in the four-year high schools and junior high schools were examined through the use of the *Stanford Achievement Test, Advanced Examination, Form B,* and the *Otis Self-Administering Test of Mental Ability, Higher Examination, Form B.* In the case of the Otis test, the Higher Examination rather than the Intermediate Examination was chosen, as a few pupils had scored very high on the latter in the seventh-grade testing. Furthermore, the Higher Examination is, according to its author, appropriate for use in Grades 7 to 12, while the upper limit for the Intermediate Examination is the ninth grade. It was originally planned to use the ninth-grade Otis I.Q.'s as a basis for checking the reliability of the Otis I.Q.'s obtained in the seventh grade, with the intention of eliminating cases in which there was a wide diver-

gence between the Otis I.Q.'s obtained in the first and second testing. Results obtained from employing the Otis Higher Examination in the ninth grades of the school systems included in this study were so erratic that they were not used in the manner intended. Instead, these results are presented in a later chapter for such light as they throw on the standardization of the Higher Examination in relation to the Intermediate Examination, and on the suitability of the Higher Examination as a measuring instrument in the ninth grade.

In scheduling the testing in the ninth grade, the same order was maintained as in the seventh-grade testing. Thus the ninth-grade pupils in Nasonville were tested a week earlier than the ninth-grade pupils in Jamesville, because the seventh-grade testing in Nasonville had preceded the seventh-grade testing in Jamesville by one week. The interval between the first and second testing was one hundred twenty-one weeks, or nearly two years and four months. No account was taken of the three or four days of difference in the length of school year in the paired communities. It is to be regretted that the interval between the first and second testing was not longer by three or four months. Conditions under which this study was conducted, however, necessitated a rather late start on the seventh-grade testing and an early start on the final testing in the ninth grade.

While the school systems were tested in the same order so as to maintain equal time intervals between the first and second examinations, the tests themselves were not given in precisely the same order as in the seventh-grade testing. In view of the fact that the investigation was primarily concerned with gains in achievement, the Stanford test was given first in the ninth grade. Sub-Tests 1-5 were administered on the first day, a recess being permitted between Sub-Tests 3 and 4. On the second day, the remainder of the Stanford test was given and followed by the Otis test. The fact that the Otis test preceded the Stanford test in the seventh grade and followed the Stanford test in the ninth grade may explain in part the erratic results obtained from the Otis test in the ninth grade.

The tests were administered by the same examiner in all schools and were scored by a trained assistant who proved to be an accurate worker. The ninth-grade results were then transcribed to the individual record cards on which the findings of the seventh-grade testing had previously been entered.

The more important facts with respect to the testing program may be summarized thus:

NUMBER OF SCHOOLS IN WHICH TESTING WAS UNDERTAKEN

	Seventh Grade		*Ninth Grade*
Nasonville 6		2	
Nelson 4	Elementary Schools	1	High Schools
Nobleboro 4		1	
Jamesville 3		3	
Jenson 2	Junior High Schools	2	Junior High Schools
Jonesboro 2		2	

TESTS EMPLOYED

Seventh Grade: *Otis Self-Administering Test of Mental Ability, Intermediate Examination, Form A.*
Stanford Achievement Test, Advanced Examination, Form A.

Ninth Grade: *Otis Self-Administering Test of Mental Ability, Higher Examination, Form B.*
Stanford Achievement Test, Advanced Examination, Form B.

NUMBER OF COMPLETE PUPIL RECORDS

	Seventh Grade	*Ninth Grade*
Nasonville	341	196
Jamesville	374	224
Nelson	321	176
Jenson	289	141
Nobleboro	256	109
Jonesboro[1]	256	150
Totals	1837	996

[1]The figures for Jonesboro do not include 39 seventh-grade records obtained in a small junior high school—records which were eliminated from the study because this junior high school did not provide as broad an offering as the two larger junior high schools in this community.

Of the 996 cases for which complete records were obtained in both seventh and ninth grades, 380 cases could not be used in building the paired groups. The remaining 616 cases contributed to the formation of the six paired groups on which the findings of this investigation are based.

CHAPTER V

THE METHOD OF INTERPRETATION

THE problem of determining the relative achievements of non-junior and junior high school pupils in the seventh, eighth, and ninth grades may be solved by studying the gains in achievement made during these grades by groups which were equivalent in achievement and potentiality at the beginning of the seventh grade but which later pursued their education under differing circumstances. In an earlier chapter it has been shown that the present investigation attempts to measure the effects of the reduced time-allotments to fundamentals which characterize junior high school education in contrast to the greater emphasis on these fundamentals in non-junior schools. In this chapter, the method of interpreting the data obtained from the testing program will be presented. Stated briefly, the method involves: (1) the pairing of pupil groups at the seventh-grade level; (2) the determination of differences in achievement between the paired groups at the ninth-grade level; and (3) the study of these differences to discover their significance.

The Determination of the Paired Groups.—As the purpose of the investigation is to study the effects of different forms of education from the seventh to the ninth grade, this factor should be the only variable in building the paired groups. Since in any study designed to measure the relative effect of differing procedures in education there are always some factors which are difficult if not impossible to control, the investigator must use methods which will ensure that these uncontrolled factors do not introduce a systematic error which will invalidate his conclusions. Though some of the uncontrolled factors of possible influence in this investigation have been shown to favor the non-junior school and others the junior high school, it can hardly be urged

that the method of the study ensures the absence of systematic errors produced by other uncontrolled factors.

The factors which were controlled in building the paired groups were sex, chronological age, Otis I.Q. near the beginning of the seventh grade, and educational age at the same point. Six paired groups were obtained:

Nasonville-Jamesville Boys
Nasonville-Jamesville Girls
Nelson-Jenson Boys
Nelson-Jenson Girls
Nobleboro-Jonesboro Boys
Nobleboro-Jonesboro Girls

The method of pairing may be illustrated in the case of the Nasonville-Jamesville boys. The record cards of the boys from these two school systems were first divided into three groups of *bright, average,* and *dull* pupils according to Otis I.Q. The classification used was:

Bright: I.Q. above 110
Average: I.Q. 91-110
Dull: I.Q. 90 or below

Paired sub-groups of bright, average, and dull pupils were built up and later combined into a larger group comprising all three levels. As each pair of pupils was chosen, the effect on the mean C.A., I.Q., and E.A. of the group was noted. The tendencies of the means to become unequal were checked through the selection of succeeding pairs. Thus, if after each group had been built up to fifteen cases, an excess of five months in C.A., a deficit of eight points in I.Q., and a deficit of three months in E.A. were noted for the non-junior group, the sixteenth pair of cases to be added to the groups was sought such that the non-junior member would possess a somewhat lower C.A., higher I.Q., and higher E.A. than the junior high school member of the pair. In this manner the groups were built up to the point where it was no longer possible to add cases without impairing the degree of equivalence already attained. Since comparisons were to be made between paired groups and not

between paired pupils, this method of pairing seemed appropriate.

It was the intention in the original plan for the study to consider the effects of non-junior and junior high schools on bright, average, and dull pupils independently, and hence these sub-groups were built up separately. After the pairing had been completed according to this method, it was decided in view of the small number of pairs of dull and bright children not to attempt these finer comparisons.

The proportionate representation of bright, average, and dull pupils in the paired groups as finally constituted is presented in Table 6.

TABLE 6

SHOWING FOR EACH OF THE PAIRED GROUPS THE NUMBER OF PUPILS AT THREE OTIS I.Q. LEVELS IN THE SEVENTH GRADE

I. Q. Group	Nasonville-Jamesville		Nelson-Jenson		Nobleboro-Jonesboro		Totals			
							Boys		Girls	
	Boys	Girls	Boys	Girls	Boys	Girls	No.	%	No.	%
90 or Below	15	13	7	5	7	12	29	19.8	30	18.7
91–110	35	36	26	26	17	30	78	53.0	92	57.1
111 or Above	14	20	17	12	9	7	40	27.2	39	24.2
Totals	64	69	50	43	33	49	147	100.0	161	100.0

It will be noted from the table that for all groups taken together the proportions of pupils at different levels are approximately 20 per cent dull, 55 per cent average, and 25 per cent bright. The approximate balance in the proportions of bright and dull pupils for all groups is not borne out when the distributions for the paired groups by systems and by sex are examined. The Nelson-Jenson groups exhibit more than twice as many bright pupils as dull in the case of both boy- and girl-groups. In the remaining groups the differences in proportions of bright and dull pupils are smaller. The fact that so large a proportion of the Nelson-Jenson groups are drawn from the bright pupils should be borne in mind as of possible bearing in the interpretation

of findings with respect to gains in achievement for these groups.

Equivalence of Paired Groups.—To enable the reader to judge the success of the pairing, the means and standard deviations of the paired groups are presented in Table 7.

TABLE 7

SHOWING FOR EACH OF THE PAIRED GROUPS THE MEANS AND STANDARD DEVIATIONS OF SEVENTH-GRADE SCORES IN CHRONOLOGICAL AGE, INTELLIGENCE QUOTIENT, AND EDUCATIONAL AGE

		Boys				Girls			
		N	C.A. mos.	Otis I.Q.	E.A. mos.	N	C.A. mos.	Otis I.Q.	E.A. mos.
Nasonville	M	64	147.9	101.1	159.4	69	146.6	103.4	160.8
	σ	64	8.7	12.5	12.5	69	7.5	13.7	13.1
Jamesville	M	64	147.9	100.8	159.5	69	146.6	103.6	160.9
	σ	64	7.9	12.9	11.3	69	7.2	13.6	11.5
Nelson	M	50	150.5	105.6	168.4	43	150.7	103.5	162.8
	σ	50	8.4	12.0	14.1	43	7.0	12.2	11.7
Jenson	M	50	150.7	105.8	168.4	43	150.6	103.5	163.0
	σ	50	8.2	12.4	13.7	43	7.0	12.2	11.5
Nobleboro	M	33	146.6	102.8	161.5	49	147.2	99.1	157.9
	σ	33	6.6	13.5	14.1	49	7.2	11.4	12.6
Jonesboro	M	33	146.4	102.9	161.7	49	147.3	99.3	158.0
	σ	33	6.7	14.0	14.6	49	7.1	11.0	10.8

This table reads as follows: A group of sixty-four boys in Nasonville was paired with a group of sixty-four boys in Jamesville. The mean chronological ages of these groups in Grade 7 were 147.9 and 147.9 months respectively; their mean Otis intelligence quotients were 101.1 and 100.8 respectively; and their mean educational ages were 159.4 and 159.5 months respectively.

An examination of the differences in means of the pair-

ed groups reveals the fact that the maximum differences are 0.2 months in chronological age, 0.3 points in Otis intelligence quotient, and 0.2 months in educational age. A study of the standard errors of these differences in means indicates that the differences are negligible. The pairing of the groups as measured by their means seems adequate. The pairing is not so satisfactory, on the other hand, from the standpoint of the standard deviations. As the conclusions of the study are based upon differences in mean gains in achievement, it is not so important that the standard deviations of the paired groups should be equivalent.

The Determination of Differences in Achievement.—The method used for establishing differences in achievement between the paired groups at the ninth-grade level involved an examination of the gains in achievement from the seventh to the ninth grade. The comparisons were made on the basis of gains in achievement because, as will be shown in the presentation of results, the paired groups, although equivalent according to educational age at the seventh-grade level, were not necessarily equivalent in each of the elements which go to make up educational age. That is, the equivalence of educational age may have obscured initial differences in reading and arithmetic—differences which were in opposite directions and which tended to neutralize each other when absorbed by the more general measure of achievement, educational age. Since the analysis of the relative achievement of pupils in non-junior and junior high schools was concerned with reading, arithmetic, and other elements independently of each other, a comparison of gains in achievement from the seventh to the ninth grade was more suitable than a comparison of mean achievement at the ninth-grade level.

Gains in achievement for each sub-test of the *Stanford Achievement Test* were expressed in terms of a scale in which the unit was one tenth of a standard deviation for the distribution of seventh-grade achievement on this sub-test. The mean seventh-grade score was arbitrarily set at 50 on this scale. The obtained seventh-grade scores then ranged from about 20 to 80. Ninth-grade scores were expressed

in terms of this same scale by extrapolating on the basis of ninth-grade performance the seventh-grade curve that expressed the relationship of raw scores to scores on the standard deviation scale. The work of determining these derived scores was undertaken in order to ensure that gains in achievement on the sub-tests would be expressed in terms of a constant scale-unit. Had it been true that the paired groups were equivalent at the seventh-grade level not only in educational age but also in each element that contributed to educational age, the use of derived scores would have been unnecessary.

The Determination of the Significance of the Differences.—The mean gains in achievement from the seventh to the ninth grade having been determined for each subtest of the *Stanford Achievement Test* and for the test as a whole, the differences between mean gains of the non-junior and junior high school members of the paired groups were obtained. The significance of each difference was studied through an examination of the ratio of the difference to its standard error, hereafter referred to as the critical ratio (C.R.).

The formulae used in determining the critical ratio were:

(1) $D_G = M_G - M_{G'}$

where D_G is the difference in mean gain;
M_G is the mean gain made by the junior-high member of a paired group;
and $M_{G'}$ is the mean gain made by the non-junior member of a paired group.

(2) $\sigma_D = \sqrt{\sigma_G^2 + \sigma_{G'}^2 - 2\,\sigma_G\,\sigma_{G'}\,r_{GG'}}$

where σ_D is the standard error of the difference in mean gain;
σ_G is the standard error of the mean gain for the junior-high member of a paired group;
$\sigma_{G'}$ is the standard error of the mean gain for the non-junior member of a paired group;
and $r_{GG'}$ is the coefficient of correlation between gains of the non-junior and junior high school pupils comprising the paired groups.

Since the gains in achievement of non-junior and junior high school pupils from the seventh to the ninth grade are correlated, the formula for the standard error of the difference which includes the correlation factor was used. The method employed for determining the coefficient of correlation between gains ($r_{GG'}$) in the case of each paired group is explained by the following illustration. The record cards of the 308 junior high school pupils in the six paired groups were arranged in rank order on the basis of seventh-grade scores on *Test 1, Paragraph Meaning,* without regard to school system. The lowest junior-high seventh-grade record was paired with the lowest non-junior seventh-grade record, the next lowest with the next, and so on. The coefficient of correlation between gains in derived score on Test 1 was then computed. Similarly coefficients of correlation were obtained for all of the Stanford subtests, for Stanford Total Score, and for Otis I.Q. This method of securing $r_{GG'}$ is justified because the coefficient of correlation between means is equal to the coefficient of correlation between variables.[1] The coefficients of correlation between gains secured by this method are presented in Table 8.

TABLE 8

SHOWING THE CORRELATION BETWEEN GAINS IN ACHIEVEMENT FROM GRADES 7 TO 9 FOR 308 PAIRS OF NON-JUNIOR AND JUNIOR HIGH SCHOOL PUPILS

Test	$r_{GG'}$	Test	$r_{GG'}$
Paragraph Meaning	0.51	Nature Study and Science	0.57
Sentence Meaning	0.42	History and Literature	0.59
Word Meaning	0.64	Language Usage	0.36
Reading Total	0.64	Dictation (Spelling)	0.67
Arithmetic Computation	0.33	Total Score	0.77
Arithmetic Reasoning	0.50		
Arithmetic Total	0.56	Otis Intelligence Quotient	0.65

To obtain the coefficient of correlation between gains

[1]Cf. Kelley, T. L., *Statistical Method.* The Macmillan Company, 1923, p. 178, formula 118.

for the paired groups of boys and girls in the three pairs of school systems separately, an unpublished formula developed by Vern James at Stanford University was used.[1] This formula was derived by James as a measure of the effect of double selection upon correlation of different measures. The formula is

$$R = \frac{-(1 - r^2)\sigma_1\sigma_2 + \sqrt{(1 - r^2)^2\sigma_1^2\sigma_2^2 + 4\,\Sigma_1^2\Sigma_2^2 r^2}}{2\,\Sigma_1\Sigma_2 r}$$

where R = the coefficient of correlation of the selected variables;

Σ_1 and Σ_2 = the standard deviations of the selected variables;

r = the coefficient of correlation of the unselected variables;

and σ_1 and σ_2 = the standard deviations of the unselected variables.

In the present study, the unselected variables were the combined groups of 308 pairs. The selected variables were in turn Nasonville-Jamesville boys, Nasonville-Jamesville girls, Nelson-Jenson boys, and so on. The use of this formula facilitated the calculation of the coefficients of correlation between mean gains ($r_{GG'}$) for each of the paired groups, as otherwise these coefficients would have had to be calculated for each paired group separately by the usual method. Thus from the 13 coefficients of correlation presented in Table 8, the 78 coefficients actually used in the study of the significance of differences were readily calculated by the aid of the Vern James formula. As the coefficients of correlation obtained by this method are reported later in connection with the presentation of results, it will suffice at this point to indicate their magnitude in the case of Stanford Total Score and Otis I.Q.

[1]The writer acknowledges his indebtedness to Professor Truman L. Kelley for suggesting this formula.

TABLE 9

SHOWING THE COEFFICIENTS OF CORRELATION BETWEEN GAINS FROM GRADES 7 TO 9 IN STANFORD TOTAL SCORE AND OTIS I.Q.

Group	N	$r_{GG'}$ Stanford Total Score	$r_{GG'}$ Otis I.Q.
Combined groups	308	0.77	0.65
Nasonville-Jamesville Boys	64	0.78	0.68
Nasonville-Jamesville Girls	69	0.74	0.58
Nelson-Jenson Boys	50	0.71	0.65
Nelson-Jenson Girls	43	0.77	0.65
Nobleboro-Jonesboro Boys	33	0.80	0.66
Nobleboro-Jonesboro Girls	49	0.70	0.64

The results reported in succeeding chapters present both the critical ratios and the chances that an obtained difference would be in the same direction if other samples of pupils in these school systems had been selected for study. Given an obtained difference between two measures, the chances that the true difference is in the same direction can be gained from a table[1] showing these chances for various values of critical ratio (difference divided by the standard error of the difference). Thus a critical ratio of 0.00 indicates that the chances are 50 in 100 that the true difference is greater than zero; a critical ratio of 1.00 indicates chances of 80 in 100; a critical ratio of 2.00 indicates chances of 98 in 100; and a critical ratio of 3.00 indicates 99.9 chances in 100.

It must be remembered that this method of studying the significance of the differences in gain between the paired groups of non-junior and junior high school pupils takes care only of chance errors due to sampling within a given school system. The method provides no measure of systematic errors—errors resulting from a failure to control

[1]Garrett, H. E., *Statistics in Psychology and Education.* Longmans, Green and Company, 1926, p. 134.

a variable other than the one under scrutiny. Some control of these systematic errors is assured in this study through the use of three pairs of school systems.

Before proceeding to a presentation of the results, it may be well to summarize the method of this investigation.

1. The study has attempted to determine the relative gains of non-junior and junior high school pupils in so-called fundamental studies from the seventh to the ninth grade.
2. Three pairs of school systems were selected such that the non-junior and the junior high school members of a pair were on the whole comparable except for variations in their organization and in their time-allotments to fundamentals.
3. For each pair of school systems, paired groups of pupils of the same sex were built up so that their mean C.A.'s, Otis I.Q.'s, and E.A.'s at the beginning of the seventh grade were equivalent.
4. The mean gains in achievement of these paired groups, as measured by the *Stanford Achievement Test*, were studied to determine the differences in gain and their significance.

CHAPTER VI

RELATIVE GAINS IN TOTAL ACHIEVEMENT

In reporting the results of this investigation of relative gains in achievement of non-junior and junior high school pupils from the seventh to the ninth grades, the gains as measured by Total Score on the *Stanford Achievement Test* and the changes in Otis intelligence quotients will first be presented. Subsequent chapters will deal with relative gains in the various aspects of reading, language, arithmetic, social studies, and science.

In each chapter, the results will be presented in tables which show for each of the paired groups (1) the status of pupils at the beginning of the seventh grade, (2) the differences in gains in achievement from Grade 7 to Grade 9, and (3) the significance of these differences. The meaning of the symbols used in these tables is as follows:

B indicates that the members of the paired group are boys.
G indicates that the members of the paired group are girls.
N = the number of pupils in each member of a paired group.

M_7 = the mean achievement of pupils comprising one member of a paired group at the beginning of the seventh grade.
σ_7 = the standard deviation of the M_7 which it accompanies.
D_7 = the difference in the mean scores (M_7) of the members of a paired group.

M_G = the mean gain in achievement (derived score) of pupils comprising one member of a paired group from Grade 7 to Grade 9.
σ_G = the standard deviation of the M_G which it accompanies.
D_G = the difference in the mean gains (M_G) of the members of a paired group.

$r_{GG'}$ = the coefficient of correlation between gains in achievement of members of a paired group.
σ_D = the standard error of the difference in mean gain (D_G).
$\frac{D_G}{\sigma_D}$ = the critical ratio, the ratio of a difference in mean gain to its standard error.

"Chances" means the number of chances in a hundred that another sampling of pupils would exhibit a difference in gain in the same direction.

+indicates a difference favorable to the junior high school member of a paired group.
−indicates a difference favorable to the non-junior member of a paired group.

Gains in Total Achievement.—The relative gains in achievement of non-junior and junior high school members of paired groups from the seventh to the ninth grade are presented in Table 10. The term "total achievement" is used in referring to total scores on the *Stanford Achievement Test.*

This table reveals the following facts.

1. The differences in mean achievement at the beginning of Grade 7 are small and unimportant. (This is to be expected, since the groups were paired on the basis of educational age in Grade 7.)
2. The differences in gains in achievement favor the non-junior school in four comparisons (Nasonville-Jamesville and Noble-boro-Jonesboro), and the junior high school in two comparisons (Nelson-Jenson).
3. Only two of the differences in gain are more than twice their standard errors. One of these differences favors the non-junior schools (Nasonville-Jamesville girls), the other the junior high school (Nelson-Jenson boys).
4. The most significant difference is found in the case of the Nasonville-Jamesville girls. Since the critical ratio is greater than 3.00, it is practically certain that another sampling from these schools would show superior gains in total achievement for the non-junior member of this paired group.

These facts appear to support the conclusion that in spite of lessened time-allotments to the fundamentals as such, the junior high schools represented in this study are the equal of the non-junior schools in achieving gains in these fundamentals. In the one case in which a clear superiority of the non-junior member of a paired group was established, the difference in gain is less than two points in derived score, which in turn is equivalent to less than one month in educational age. In the remaining five cases, the difference in no

TABLE 10

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN TOTAL ACHIEVEMENT (STANFORD TOTAL SCORE) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN BETWEEN NON-JUNIOR AND JUNIOR HIGH SCHOOL MEMBERS OF THE PAIRED GROUPS, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	60.22	9.37	+0.06	16.62	5.13	−0.65	0.78	0.40	−1.62	94
Jamesville			60.28	8.30		15.97	4.52					
Nasonville	G	69	61.22	9.45	−0.05	15.01	4.20	−1.83	0.74	0.38	−4.86	99.9+
Jamesville			61.17	8.52		13.18	4.39					
Nelson	B	50	66.72	10.23	−0.12	15.94	3.80	+0.88	0.71	0.44	+2.00	98
Jenson			66.60	9.93		16.82	4.26					
Nelson	G	43	62.65	8.34	+0.07	14.52	4.62	+0.51	0.77	0.48	+1.06	85
Jenson			62.72	8.63		15.03	4.60					
Nobleboro	B	33	61.64	10.24	+0.26	14.95	4.41	−0.78	0.80	0.60	−1.31	90
Jonesboro			61.90	10.75		14.17	5.76					
Nobleboro	G	49	59.14	9.14	+0.31	13.50	3.68	−0.45	0.70	0.45	−1.01	84
Jonesboro			59.45	8.37		13.01	4.29					

case exceeds two weeks in educational age. If differences of this magnitude were consistently in the same direction, one might make a case for the type of education which produced even these small gains. In the absence of any consistency in direction, however, the differences as a whole seem to be explained best by a combination of chance factors and other factors in the individual school systems not subject to control in this study.

Although the interpretation presented in the foregoing paragraph appears to be valid, it should be noted that the facts revealed by comparisons of relative gains in achievement might be used to support a different conclusion. In Chapter V attention was directed to the fact that the Nelson-Jenson paired groups had higher mean intelligence quotients than the groups from the other communities. These Nelson-Jenson groups exhibited gains in achievement favorable to Jenson (Table 10). From these facts, one might infer that the junior high school practice of reducing time-allotments to fundamentals appears to benefit pupils who are above average intelligence. This inference is further supported by the fact that the mean intelligence quotients of the Nasonville-Jamesville groups were the lowest of those included in the investigation and also by the fact that the Nasonville groups exceeded the Jamesville groups in gains in total achievement. The writer believes that the data would not justify this inference unless the inference could be supported through studies of relative gains in achievement of bright, average, and dull pupils as distinct groups. Yet it appears to be a reasonable conjecture that the practice of reducing time-allotments to fundamentals characteristic of the junior high school has worked to the disadvantage of the duller pupils at least in so far as growth in power over fundamentals is concerned. Whichever interpretation the reader favors, it can be asserted with confidence that the magnitude of the differences is such that no serious disadvantage to dull pupils results from reduced time-allotments to fundamentals.

Changes in Otis Intelligence Quotients.—The *Otis Self-Administering Test of Mental Ability* was used in this study

both at the seventh- and ninth-grade levels. The results from the seventh-grade testing were used as one basis of equivalence in determining the paired groups. The intention was to use the ninth-grade Otis I.Q.'s as a check on the seventh-grade Otis I.Q.'s so that cases in which seventh-grade Otis I.Q.'s seemed unreliable might be thrown out. It will be recalled that the *Intermediate Examination* was used in the seventh grade and the *Higher Examination* in the ninth grade. The results of the ninth-grade intelligence testing proved so erratic that they were not used as originally intended. Though the ninth-grade Otis I.Q.'s were not deemed sufficiently reliable for judging individuals, the changes in mean I.Q. are reported for such light as they throw on the findings with respect to total achievement.

If it be true that there is large overlapping in function between a general achievement test and a group test of intelligence, it would be expected that the differences in total achievement already demonstrated would be confirmed by similar differences in gains in intelligence. That this confirmation is lacking is to be seen from an examination of the results presented in Table 11.

1. The mean differences in Otis I.Q. of the members of the paired groups in Grade 7 are small and unimportant. (The groups were constructed on the basis of equivalence in seventh-grade I.Q.)
2. The members of all six paired groups sustained a loss in mean I.Q. from Grade 7 to Grade 9.
3. In all six comparisons, the non-junior member of a paired group lost relatively less in mean I.Q. than the junior high school member with which it was paired.
4. In three comparisons (Nasonville-Jamesville girls, and both Nelson-Jenson groups), the difference in gain is more than twice its standard error.
5. The relative superiority of Jenson over Nelson in total achievement (Table 10) is not confirmed by parallel changes in Otis I.Q.'s.

The one conclusion which seems justified from these facts is that the *Otis Intermediate* and *Higher Examinations*

TABLE 11

SHOWING FOR EACH OF THE PAIRED GROUPS THE CHANGES IN INTELLIGENCE QUOTIENT FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THEIR SIGNIFICANCE. *Otis Self-Administering Test of Mental Ability: Intermediate Examination*, Grade 7; *Higher Examination*, Grade 9

	Sex	N	M_7	σ_7	D_7	M_G*	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	101.09	12.51	−0.28	−3.75	7.72	−0.91	0.68	0.79	−1.15	87
Jamesville			100.81	12.93		−4.66	8.15					
Nasonville	G	69	103.38	13.71	+0.17	−4.78	6.67	−3.16	0.58	0.73	−4.33	99.9+
Jamesville			103.55	13.61		−7.94	6.61					
Nelson	B	50	105.56	12.02	+0.26	−1.54	6.88	−2.88	0.65	0.91	−3.18	99.9+
Jenson			105.82	12.39		−4.42	8.23					
Nelson	G	43	103.50	12.18	0.00	−4.15	7.54	−2.65	0.65	0.96	−2.77	99.7
Jenson			103.50	12.24		−6.80	7.39					
Nobleboro	B	33	102.83	13.50	+0.04	−5.32	7.81	−0.73	0.66	1.10	−0.66	74
Jonesboro			102.87	13.95		−6.05	7.38					
Nobleboro	G	49	99.13	11.39	+0.25	−5.30	7.86	−0.49	0.64	0.90	−0.54	71
Jonesboro			99.38	10.95		−5.79	7.00					

*The minus signs indicate a mean loss. This section of the table reads: The Nasonville boys lost on the average 3.75 points in I.Q. between Grades 7 and 9; the Jamesville boys lost 4.66 points in I.Q. during the same period. Thus the Nasonville boys gained more (0.91 points) in that they lost less than the Jamesville boys.

are improperly standardized with respect to each other. It is reasonable to expect that a proper standardization would yield ninth-grade mean I.Q.'s which were at least the equal of seventh-grade mean I.Q.'s. The source of the difficulty may be found in the inappropriateness of the *Higher Examination* as a measure of intelligence in the ninth grade. The examination proved too difficult for the duller pupils in this grade. A large proportion of these pupils were unable to respond correctly to more than fifteen items. On the other hand, the *Intermediate Examination* is not sufficiently difficult to measure properly the brightest pupils in the ninth grade, though this examination has high reliability at the seventh-grade level.

It is difficult to interpret the results of the Otis tests in relation to the results of the Stanford tests. Granted that the reliability of the *Otis Higher Examination* is not sufficiently high to justify its use for individual measurement in the ninth grade, the reliability is probably high enough to warrant the use of this test in group measurement. Yet the results of such use do not confirm the findings of the *Stanford Achievement Test.* Since the latter test has a higher reliability than the former, and since the Stanford test provides a more direct measure of the functions under scrutiny, the conclusion that, from the standpoint of gains in total achievement, neither type of school has demonstrated its superiority over the other, would appear to be justified.

The fact that the study of relative gains in total achievement fails to show a consistent superiority for either the non-junior or the junior high school should not be interpreted as implying the absence of significant differences in relative gains in the functions which together comprise total achievement. A superiority of the non-junior school in achieving gains in arithmetic, for example, may be offset by a superiority of the junior high school in achieving gains in the social studies and sciences. It will be necessary, therefore, to examine the relative gains in achievement in the detailed elements of the *Stanford Achievement Test* to determine whether in any phase of achievement one type of school achieves significantly greater gains than the other.

CHAPTER VII

RELATIVE GAINS IN READING

ACHIEVEMENT in reading is measured by the *Stanford Achievement Test* in three different ways. "The three parts together are intended to cover the three main factors involved in getting the meaning from the printed page: knowledge of word meaning, ability to comprehend relatively short language units (sentences), ability to grasp the meaning of larger units (paragraphs). These factors are closely interrelated, but they are not identical. They make different demands on the span of attention and on the ability to grasp the significance of a language unit as a whole as contrasted with the ability to understand words, phrases, or other isolated fragments."[1]

It will be recalled that the school systems included in this study were selected because of marked differences in time-allotments to fundamentals. In no aspect of the program of studies is the difference in emphasis more pronounced than in the relative time-allotments to the various phases of English. In each of the three non-junior systems, reading is a distinct subject of study in the seventh and eighth grades. In two of the three non-junior systems the time allotted to reading is over 60 per cent of the time devoted to all phases of English in the corresponding junior high school systems. The junior high school has tended to assume that beyond the sixth grade growth in reading ability is best brought about through the use of the ability in many types of school activity. The non-junior school, on the contrary, has continued to accord reading, as such, a place in its program. It will be of interest to note what effects, if any, these differing views of the place of reading have on the growth of reading ability in the seventh to the ninth grade. The discussion of the conclusions of this investigation on

[1]Kelley, T. L., Ruch, G. M., and Terman, L. M., *Stanford Achievement Test*, Manual of Directions. World Book Company, 1928, p. 8.

growth in reading ability will be postponed until the gains in achievement in word meaning, sentence meaning, paragraph meaning, and reading total have been set forth.

Word Meaning.—The relative gains of non-junior and junior high school groups in the ability to grasp the meaning of words are presented in Table 12.

An examination of the table will reveal these facts:

1. The members of the paired groups exhibit differences in ability in word meaning at the seventh-grade level which vary from one to three points (two to six months of subject age). Four out of the six differences indicate superiority of the non-junior group at the beginning of the investigation.
2. Gains in ability in word meaning favor the junior high school member of a paired group in two instances (Nasonville-Jamesville boys and Nelson-Jenson boys). In the remaining four cases the non-junior school is favored.
3. Only two of the differences in gain are more than twice their standard errors (Nasonville-Jamesville girls and Nobleboro-Jonesboro girls). Both of these differences favor the non-junior member of the paired group.

Sentence Meaning.—Table 13 presents the findings of the study with respect to growth in power to gain meaning from short language units.

The more important facts appear to be:

1. The differences in initial ability[1] within paired groups vary from one-half to two points (three weeks to three months of subject age). In five out of six cases, there is an initial superiority of the junior high school member of a pair.
2. Gains in ability in sentence meaning favor the non-junior member of a paired group in five out of six instances. The exception is found in the case of the Nelson-Jenson girls.
3. Only one difference in gain is more than twice its standard error (Nelson-Jenson girls). Thus the most significant difference found is in the case of the one group in which the difference was in the direction of junior high school superiority.

Paragraph Meaning.—The relative gains of the paired

[1]The term "initial ability" will be used in this and subsequent chapters to mean "the amount of ability present at the time of the initial testing in the seventh grade."

TABLE 12

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN WORD MEANING (STANFORD SUB-TEST 3) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	52.4	9.9	−1.2	11.31	6.57	+1.00	0.65	0.67	+1.50	93
Jamesville			51.2	10.7		12.31	6.25					
Nasonville	G	69	52.9	9.9	−1.8	12.02	5.18	−1.82	0.57	0.62	−2.95	99.8
Jamesville			51.1	9.4		10.20	5.83					
Nelson	B	50	57.5	11.0	−3.0	11.02	5.34	+1.28	0.64	0.79	+1.62	94
Jenson			54.5	11.3		12.30	7.17					
Nelson	G	43	52.9	8.0	+1.3	10.71	6.44	−0.51	0.70	0.85	−0.60	73
Jenson			54.2	9.3		10.20	7.65					
Nobleboro	B	33	53.1	9.8	−1.4	11.50	5.59	−0.97	0.56	0.89	−1.10	86
Jonesboro			51.7	8.4		10.53	5.21					
Nobleboro	G	49	51.0	8.8	+1.6	10.52	5.35	−2.78	0.60	0.75	−3.71	99.9+
Jonesboro			52.6	7.3		7.74	6.21					

TABLE 13

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN SENTENCE MEANING (STANFORD SUB-TEST 2) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	45.9	14.0	+1.4	11.88	8.56	−0.94	0.40	1.10	−0.85	80
Jamesville			47.3	12.3		10.94	7.52					
Nasonville	G	69	47.0	14.7	+2.0	10.22	8.50	−0.55	0.39	1.06	−0.52	70
Jamesville			49.0	10.0		9.67	7.34					
Nelson	B	50	50.8	16.0	+1.0	11.06	7.94	−0.92	0.37	1.21	−0.76	77
Jenson			51.8	13.2		10.14	7.31					
Nelson	G	43	47.5	12.2	+1.6	8.29	8.86*	+3.49	0.44	1.38	+2.53	99.4
Jenson			49.1	11.8		11.78	8.12					
Nobleboro	B	33	44.1	15.0	+1.6	12.77	7.94	−2.18	0.41	1.54	−1.41	92
Jonesboro			45.7	17.5		10.59	8.42					
Nobleboro	G	49	42.6	12.6	−0.5	12.68	6.73	−1.27	0.43	1.39	−0.91	82
Jonesboro			42.1	16.8		11.41	10.44					

*σ_G is larger than M_G in several of the tables owing to the presence, in nearly every group, of pupils whose ninth-grade scores were lower than their seventh-grade scores; i.e., in these cases the individual's gain was negative.

TABLE 14

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN PARAGRAPH MEANING (STANFORD SUB-TEST 1) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	72.3	12.3	−1.0	11.75	7.74	+1.06	0.52	0.98	+1.09	86
Jamesville			71.3	10.5		12.81	8.10					
Nasonville	G	69	71.6	12.2	−0.2	12.95	7.35	−0.81	0.52	0.95	−0.85	80
Jamesville			71.4	11.4		12.14	8.65					
Nelson	B	50	79.3	11.5	−5.2	10.66	6.59	+3.04	0.43	1.04	+2.92	99.8
Jenson			74.1	14.3		13.70	7.20					
Nelson	G	43	73.8	11.0	−1.8	11.36	7.73	+2.79	0.48	1.17	+2.40	99.2
Jenson			72.0	11.5		14.15	7.29					
Nobleboro	B	33	73.6	9.0	−1.7	11.02	7.46	−0.07	0.53	1.38	−0.05	52
Jonesboro			71.9	10.1		10.95	8.72					
Nobleboro	G	49	70.4	12.2	+2.0	10.32	7.79	−0.62	0.49	1.09	−0.56	72
Jonesboro			72.4	10.2		9.70	7.47					

TABLE 15

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN READING TOTAL (STANFORD SUB-TESTS 1, 2, AND 3 COMBINED) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	169.2	32.5	+0.2	13.09	7.03	+0.07	0.68	0.67	+0.01	50
Jamesville			169.4	30.3		13.16	5.61					
Nasonville	G	69	170.2	33.4	+1.5	13.15	5.59	−1.48	0.63	0.60	−2.48	99.4
Jamesville			171.7	27.2		11.67	5.83					
Nelson	B	50	187.9	35.7	−7.2	12.10	5.41	+1.20	0.61	0.69	+1.73	96
Jenson			180.7	36.9		13.30	5.70					
Nelson	G	43	175.1	26.0	+0.5	11.08	5.66	+2.37	0.61	0.75	+3.17	99.9+
Jenson			175.6	27.2		13.45	5.44					
Nobleboro	B	33	170.9	28.7	−2.4	13.98	4.95	−2.12	0.64	0.92	−2.30	98.9
Jonesboro			168.5	33.1		11.86	6.81					
Nobleboro	G	49	164.0	28.8	+3.5	12.36	4.21	−1.47	0.56	0.73	−2.01	98
Jonesboro			167.5	28.5		10.89	6.07					

groups in power to comprehend the meaning of a paragraph are given in Table 14.

1. Differences in initial ability favor the non-junior member of a pair in five out of six cases. In one case (Nelson-Jenson boys) this initial difference is more than five points, or approximately one year of subject age.
2. The differences in gain favor the junior high school member of a pair in three instances and the non-junior member in three instances.
3. Two of the six differences are more than twice their standard errors (Nelson-Jenson boys and Nelson-Jenson girls). These differences in gain are favorable to the junior high school member.

Reading Total.—If the pupil's scores on word meaning, sentence meaning, and paragraph meaning are added together, the resulting factor is known as "reading total." The relative gains in reading totals are set forth in Table 15.

1. Differences in initial ability as shown by reading total are in four out of six instances in favor of the junior high school member of a pair. The most extreme margin of initial superiority is found in the case of the Nelson-Jenson boys. The non-junior member of this pair exhibits a seven-point superiority over the junior high school member. This margin of superiority is equivalent to about seven months of reading age.
2. The differences in gains in reading total favor the non-junior and junior high school members in three instances each.
3. Four of the differences in gain exceed twice their standard errors. Three of these favor the non-junior member; one favors the junior high school member. As this last difference is more than three times its standard error, its direction is practically certain.

Interpretation of the Results in Reading.—Before attempting to interpret the results in reading some cognizance must be taken of differences in initial ability. These initial differences appear in the paired groups because the method of pairing used equivalence in educational age as one element but did not seek the refinement of pairing on the basis of the separate subject ages which together comprise educa-

tional age. It was hoped that holding the educational age constant for the members of a pair would prevent wide discrepancies in initial ability on the sub-tests of the Stanford examination. Yet initial differences in excess of six months of subject age were found in the cases of certain paired groups.

What influence do these differences in initial ability exercise in predicating gains in ability from the seventh to the ninth grade? Does the member having a higher initial ability tend to gain more or less than its counterpart in the paired group? An examination of the direction of initial differences in relation to differences in gain indicates that in only slightly more than half the cases the member of a paired group having the lower initial ability gained more in the experimental period. The inference is that, in view of the bases which were used in establishing initial equivalence in paired groups, differences in initial ability in a given aspect of educational age are not of importance in influencing subsequent gains in ability.

If, then, one may ignore differences in initial ability, the interpretation of the findings of the various measures of reading ability is relatively simple. The number of instances in which substantial differences in gain have been established is summarized in Table 16.

TABLE 16

SHOWING THE NUMBER OF COMPARISONS IN WHICH A SUBSTANTIAL DIFFERENCE IN GAIN HAS BEEN SHOWN IN VARIOUS MEASURES OF READING $\left(\frac{D_G}{\sigma_D} > 2\right)$

Measures of Reading Ability	Differences Favoring	
	Non-Junior	Junior High
Word Meaning	2	—
Sentence Meaning	—	1
Paragraph Meaning	—	2
Reading Total	3	1

Thus of nine substantial differences in gain, five are favorable to the non-junior school and four to the junior high school. Fifteen differences were less than twice their standard errors and hence not regarded as substantial differences. The interpretation which appears most defensible is that neither school has demonstrated superiority over the other in securing gains in reading ability. Substantial differences are exhibited by certain pairs of schools on certain tests of reading ability, but these differences do not seem to be due to the differences in time allotted to instruction in reading.

CHAPTER VIII

RELATIVE GAINS IN LANGUAGE

THIS chapter will consider the growth in power over language in the seventh to the ninth grade for the paired groups of non-junior and junior high school pupils. The *Stanford Achievement Test* offers measures of two aspects of language ability: grammatical usage and spelling. The test of usage measures the extent to which a pupil recognizes the correct grammatical form when two alternatives are offered. It does not test directly the pupil's grammatical habits in oral and written expression. It is important, however, to learn whether the pupil knows the correct form, as such knowledge is a prerequisite to the correction of faulty diction. The test of spelling is a dictation exercise in which the words tested are arranged in sentences. The pupil is not informed that the purpose of the exercise is to test spelling, yet pupils at the seventh-grade level readily recognize it as a spelling test. The reliabilities of the tests of language usage and spelling, though not as high as those of the reading tests, are high enough to justify the use of the tests for individual measurement.

Language Usage.—The results of the language-usage test with groups of non-junior and junior high school pupils in the seventh to the ninth grade are given in Table 17.

These facts appear from a study of the table:

1. Differences in initial ability in language usage favor the non-junior and junior high school members of paired groups an equal number of times. These differences vary from one-half point to five points, or from one to ten months of subject age.
2. The differences in gain in language usage from the seventh to the ninth grade favor the junior high school member of a paired group in four out of six cases.
3. Only one of the differences is more than twice its standard error. This difference, which is found in the case of the

TABLE 17

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN LANGUAGE USAGE (STANFORD SUB-TEST 8) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	27.5	10.3	+1.3	10.03	10.30	+1.22	0.36	1.32	+0.92	82
Jamesville			28.8	9.6		11.25	8.02					
Nasonville	G	69	30.2	10.4	−0.5	10.25	10.52	+0.15	0.39	1.29	+0.11	54
Jamesville			29.7	9.8		10.40	8.69					
Nelson	B	50	33.3	9.8	−2.2	8.54	8.57	+2.72	0.32	1.40	+1.94	97
Jenson			31.1	11.0		11.26	8.45					
Nelson	G	43	34.1	9.2	−1.6	6.20	9.25	+1.67	0.32	1.52	+1.10	86
Jenson			32.5	9.3		7.87	7.63					
Nobleboro	B	33	24.9	9.2	+5.0	14.47	9.33	−4.79	0.34	1.77	−2.70	99.7
Jonesboro			29.9	9.8		9.68	8.40					
Nobleboro	G	49	27.9	10.6	+2.0	10.64	8.64	−1.83	0.31	1.40	−1.31	90
Jonesboro			29.9	10.7		8.81	7.98					

Nobleboro-Jonesboro boys, favors the non-junior member of the pair. It will be noted that this one substantial difference is found in the case of largest difference in initial ability.

The findings of the language-usage test lead to the conclusion that neither type of school has proved its superiority over the other in furthering growth in knowledge of correct grammatical usage. It will be recalled, however, that the junior high schools allot substantially less time to language teaching than do the non-junior schools. If the results from the language-usage test may be considered as indicative of results which would be gained were a broader measure of language ability used, the finding would appear to justify the junior high school in reducing the time-allotments to language study.

Spelling.—In Table 18, the results of the dictation exercise are presented.

1. Differences in initial ability in spelling favor the junior high school member of the paired group in four out of six instances. These differences vary from about one to nine points or from one to seven months in spelling age.
2. The differences in gain in spelling ability favor the non-junior school in four out of six cases.
3. In each paired group, the member having the lower status in spelling ability at the seventh-grade level gained more than its pair from the seventh to the ninth grade.
4. Each of the six differences in gain is at least twice its standard error. The differences in gain are more than three times their standard errors in the Nobleboro-Jonesboro comparisons.

Although the differences in gain are in each case substantial, it is probably unfair to conclude that either type of school has demonstrated superiority over the other in fostering growth in spelling ability. A fairer inference might be that the differences in initial ability explain the differences in gain. In the case of this function, relatively low initial status appears to predicate relatively high gains in ability and *vice versa*. One finds support in these findings, also, for the hypothesis that brighter pupils benefit and duller pupils suffer from reduced time-allotments to fundamentals, at least in so

TABLE 18

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN SPELLING (STANFORD SUB-TEST 9) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	124.7	23.8	+1.1	16.72	6.32	−1.34	0.71	0.60	−2.24	98.7
Jamesville			125.8	22.1		15.38	6.29					
Nasonville	G	69	135.9	23.5	+6.2	15.93	5.54	−1.51	0.68	0.58	−2.61	99.5
Jamesville			142.1	23.7		14.42	6.34					
Nelson	B	50	146.4	24.1	−8.8	13.58	5.18	+1.60	0.63	0.65	+2.45	99.3
Jenson			137.6	23.5		15.18	5.49					
Nelson	G	43	145.8	20.9	−8.1	13.83	5.28	+1.44	0.66	0.72	+2.00	98
Jenson			137.7	21.5		15.27	6.13					
Nobleboro	B	33	132.3	23.7	+2.8	14.17	5.82	−3.28	0.61	0.82	−3.97	99.9+
Jonesboro			135.1	23.0		10.89	4.55					
Nobleboro	G	49	134.4	22.5	+7.1	14.03	3.66	−2.77	0.43	0.58	−4.75	99.9+
Jonesboro			141.5	22.1		11.26	4.00					

far as spelling is concerned. Attention has already been directed to the higher mean I.Q.'s of the Nelson-Jenson groups. In the comparisons of growth in spelling ability, the Jenson groups gain more than the Nelson groups. Yet Nelson devotes fifty minutes per week to spelling as a distinct subject in the seventh and eighth grades. It is impossible to state how much of the time devoted to English in the Jenson junior high schools is employed in the teaching of spelling, as the distribution of time is left to the discretion of the individual teachers of English. In the absence of adequate evidence on the issue of the effect of reduced time-allotments to fundamentals on bright, average, and dull pupils as distinct groups, it seems fair to infer that neither type of school has excelled the other in furthering gains in spelling ability, but that within paired groups a relatively low status in the seventh grade indicates the likelihood of more rapid growth in spelling from the seventh to the ninth grade.

CHAPTER IX

RELATIVE GAINS IN ARITHMETIC

THE *Stanford Achievement Test* offers two measures of ability in arithmetic: a test of computation and a test of arithmetic reasoning. The results on these sub-tests will be reported separately and also in combination as an "arithmetic total."

In interpreting the relative gains of non-junior and junior high school pupils in arithmetic abilities, it should be noted that differences in time-allotments to mathematics do not vary greatly from one type of school to the other. It will be recalled that no appreciable difference was noted between the mathematics programs in Nasonville and Jamesville. Each of these schools teaches arithmetic as a required study in both the seventh and eighth grades and algebra as an elective in the ninth grade. Jamesville devotes about ten per cent more time to arithmetic in the seventh and eighth grades than Nasonville. Hence the comparisons in the case of the Nasonville-Jamesville groups give no measure of the effect of reduced time-allotments to arithmetic in the junior high school. The results of arithmetic testing in this pair of school systems is reported nevertheless for the sake of completeness.

In the Nelson-Jenson and Nobleboro-Jonesboro groups, on the other hand, a real difference in the mathematics program is in evidence. Although the time-allotments to mathematics in the seventh and eighth grades are about the same in Nelson and Jenson, the former school system teaches arithmetic while the latter provides a course in general mathematics in which the emphasis on arithmetic has yielded to an emphasis on intuitional geometry and the algebra of the simple equation. This same difference in emphasis is evident in the Jonesboro junior high schools as contrasted with the unreorganized schools of Nobleboro. Furthermore, Nobleboro devotes about twenty per cent more

time to arithmetic in the seventh and eighth grades than Jonesboro devotes to general mathematics. In view of these facts, the results of arithmetic testing in the Nelson-Jenson and Nobleboro-Jonesboro groups may help to solve the problem which is subject to scrutiny in this investigation.

Arithmetic Computation.—The relative growth of non-junior and junior high school pupils in ability to compute is set forth in Table 19.

1. The differences in initial ability in arithmetic computation favor the non-junior school in five out of six cases. These differences vary from about one to seven points, or from a few weeks to ten months of subject age.
2. The differences in gain in computing ability from the seventh to the ninth grade favor the junior high school member of a pair in five out of six cases.
3. In four of these five cases an initial inferiority is associated with superiority in gain.
4. Only one of the six differences in gain (Nobleboro-Jonesboro girls) is more than twice its standard error. This case is one in which a large difference in initial ability is observed.

Arithmetic Reasoning.—The results of testing in arithmetic problems involving reasoning parallel closely the results in arithmetic computation (Table 20).

1. The differences in initial ability in arithmetic reasoning favor the non-junior and junior high school members of a pair with equal frequency. These differences vary from one-half point to five points. The maximum difference is equivalent to approximately three months of subject age.
2. The most pronounced differences in initial ability in problem-solving are found in the cases of Nasonville-Jamesville boys, Nelson-Jenson boys, and Nobleboro-Jonesboro girls. These same groups exhibited differences of initial ability in computation in the same directions.
3. Differences in gain in arithmetic reasoning favor the junior high school member of a pair in four out of six cases.
4. In three out of these four cases an initial inferiority is associated with superiority in gain.
5. Only two of the differences in gain are more than twice their standard errors. These two are found in the cases of the Nelsen-Jenson boys and the Nobleboro-Jonesboro girls.

TABLE 19

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN ARITHMETIC COMPUTATION (STANFORD SUB-TEST 4) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	121.8	18.1	−7.0	6.94	8.68	+0.40	0.29	1.35	+0.30	62
Jamesville			114.8	14.9		7.34	9.48					
Nasonville	G	69	123.5	17.5	−2.0	5.99	9.38	−2.43	0.32	1.34	−1.82	96
Jamesville			121.5	13.9		3.56	9.60					
Nelson	B	50	115.8	16.5	+2.0	11.26	8.32	+2.48	0.23	1.39	+1.79	96
Jenson			117.8	17.4		13.74	7.41					
Nelson	G	43	118.6	15.6	−0.9	7.69	10.00	+0.74	0.37	1.80	+0.41	65
Jenson			117.7	19.1		8.43	10.94					
Nobleboro	B	33	115.5	17.4	−1.1	6.35	9.46	+0.30	0.31	1.92	+0.16	56
Jonesboro			114.4	18.8		6.65	9.39					
Nobleboro	G	49	120.2	15.4	−6.7	3.91	10.09	+3.75	0.32	1.61	+2.34	99
Jonesboro			113.5	15.2		7.66	9.20					

TABLE 20

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN ARITHMETIC REASONING (STANFORD SUB-TEST 5) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	76.8	11.9	−3.0	10.97	9.26	+0.59	0.52	0.92	+0.64	74
Jamesville			73.8	12.2		11.56	7.62					
Nasonville	G	69	74.4	14.0	+0.5	8.34	7.55	−1.30	0.41	0.92	−1.41	92
Jamesville			74.9	11.3		7.04	6.38					
Nelson	B	50	83.2	16.3	+4.4	11.82	8.08	+2.64	0.43	1.12	+2.37	99.1
Jenson			87.6	16.7		14.46	6.50					
Nelson	G	43	72.7	15.0	+0.6	12.62	7.13	−0.42	0.43	1.17	−0.36	64
Jenson			73.3	13.0		12.20	7.25					
Nobleboro	B	33	80.2	15.2	−2.7	8.59	9.46	+2.67	0.53	1.47	+1.81	96
Jonesboro			77.5	17.5		11.26	7.82					
Nobleboro	G	49	72.8	15.4	−5.1	7.38	8.48	+2.98	0.52	1.18	+2.53	99.4
Jonesboro			67.7	11.3		10.36	8.39					

Arithmetic Total.—When the individual scores in computation and reasoning are combined into a total arithmetic score, the relative gains of the paired groups appear as in Table 21.

This table reveals these facts:

1. The initial differences in ability as represented by total arithmetic score are favorable to the non-junior member of a pair in four out of six instances. In one case the initial difference is favorable to the junior high school member. In the remaining cases (Nelson-Jenson girls) the difference is negligible.
2. The differences in gain favor the junior high school in four out of six cases. One of the differences favors the non-junior school, while the remaining difference (Nelson-Jenson girls) is negligible.
3. Two of the differences in gain are substantial. These differences are found in the cases of the Nelson-Jenson boys and the Nobleboro-Jonesboro girls. In each case, the difference is more than three times its standard error.

Interpretation of the Results in Arithmetic.—It is probably unwise to conclude from this study of the relative gains in arithmetic ability that the junior high school is furthering growth of these abilities to a greater degree than the non-junior school. To be sure, the five substantial differences in gain which were obtained were all favorable to the junior high school member of a paired group. But these five differences were contributed by only two groups: Nelson-Jenson boys, arithmetic reasoning and arithmetic total; Nobleboro-Jonesboro girls, arithmetic computation, arithmetic reasoning, and arithmetic total. Furthermore, in the case of the Nelson-Jenson boys, the superiority in gains is associated with superiority in initial ability. In the case of the Nobleboro-Jonesboro girls, on the other hand, the superiority in gains is associated with inferior status in initial ability. If differences in initial ability may be ignored in considering relative gains in arithmetic ability, there would be some justification for the conclusion that the junior high schools included in this study are superior to the non-junior schools in promoting growth in power in arithmetic. In

TABLE 21

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN ARITHMETIC TOTAL (STANFORD SUB-TESTS 4 AND 5) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	198.4	23.6	−10.2	10.03	8.21	+0.56	0.53	0.96	+0.57	72
Jamesville			188.2	24.4		10.59	7.61					
Nasonville	G	69	197.8	27.3	−1.6	7.88	7.59	−1.57	0.49	0.90	−1.74	96
Jamesville			196.2	22.4		6.31	7.13					
Nelson	B	50	199.3	30.3	+6.4	13.14	7.06	+3.68	0.41	1.00	+3.67	99.9+
Jenson			205.7	29.1		16.82	5.82					
Nelson	G	43	191.4	25.8	−0.2	12.10	7.77	+0.10	0.54	1.18	+0.08	53
Jenson			191.2	28.5		12.20	8.33					
Nobleboro	B	33	195.2	28.8	−3.1	8.77	8.31	+1.70	0.57	1.36	+1.25	89
Jonesboro			192.1	33.0		10.47	8.56					
Nobleboro	G	49	192.9	26.9	−12.0	6.48	8.47	+4.00	0.57	1.12	+3.58	99.9+
Jonesboro			180.9	23.0		10.48	8.50					

view of the further fact, however, that thirteen of the eighteen differences in gain were not sufficiently large to be regarded as substantial, this interpretation of the findings would be difficult to maintain. A more tenable conclusion is that the evidence fails to show that junior high school pupils have suffered in development of arithmetic abilities through a change of emphasis in mathematics from arithmetic to the broader field of general mathematics.

CHAPTER X

RELATIVE GAINS IN SOCIAL STUDIES AND SCIENCE

THE *Stanford Achievement Test* offers two sub-tests which yield some evidence on growth in social and scientific information. These sub-tests are entitled *History and Literature* and *Nature Study and Science.* As these titles are not sufficiently broad to describe accurately the content of the tests, the terms "social studies" and "science" will be used in presenting the test results.

The relative gains of non-junior and junior high school pupils in mastery over content were not of primary concern here. The main problem was to determine the effect of varying time-allotments on growth in power over the fundamentals of reading, language, and arithmetic. For this purpose the school systems selected have served reasonably well. These school systems are not so satisfactory for studying relative gains in social studies and science because of the absence of a consistent difference in practice between the non-junior and junior high schools. Thus, in the seventh and eighth grades, Nasonville devotes more time than Jamesville to history, geography, and civics. Nelson and Jenson allot about the same amount of time to the social studies, while Nobleboro assigns less time to this field than Jonesboro. In science similar inconsistencies in time-allotments are noted. A valid study of relative growth in social studies and science would necessitate a pairing of school systems with this object in view. Since the *Stanford Achievement Test* afforded a ready opportunity for securing scores on tests in social studies and science, the results on these tests are reported as a part of this investigation.

Social Studies.—The relative gains of non-junior and junior high school groups in knowledge of the social studies are given in Table 22.

TABLE 22

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN SOCIAL STUDIES (STANFORD SUB-TEST 7) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	$r_{GG'}$	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	40.5	16.7	+1.6	12.34	6.11	−1.56	0.55	0.73	−2.14	98
Jamesville			42.1	16.5		10.78	6.20					
Nasonville	G	69	34.7	16.3	−4.8	11.12	7.13	−1.13	0.57	0.73	−1.55	93
Jamesville			29.9	14.3		9.99	5.68					
Nelson	B	50	51.2	19.0	−1.0	11.18	5.55	−0.36	0.52	0.82	−0.44	67
Jenson			50.2	17.7		10.82	6.22					
Nelson	G	43	38.4	15.5	−1.3	9.78	7.45	+1.67	0.66	0.94	+1.78	96
Jenson			37.1	16.0		11.45	7.40					
Nobleboro	B	33	45.3	17.8	−0.4	8.47	6.32	+0.48	0.64	1.11	+0.44	66
Jonesboro			44.9	19.8		8.95	8.15					
Nobleboro	G	49	32.3	14.0	+3.2	7.70	4.89	−0.93	0.52	0.87	−1.08	86
Jonesboro			35.5	14.9		6.77	6.91					

TABLE 23

SHOWING FOR EACH OF THE PAIRED GROUPS THE GAINS IN SCIENCE (STANFORD SUB-TEST 6) FROM GRADES 7 TO 9, THE DIFFERENCES IN GAIN, AND THE SIGNIFICANCE OF THE DIFFERENCES

	Sex	N	M_7	σ_7	D_7	M_G	σ_G	D_G	r_{GG}	σ_D	$\frac{D_G}{\sigma_D}$	Chances
Nasonville	B	64	44.4	13.9	+4.8	14.66	7.03	−1.35	0.54	0.79	−1.71	96
Jamesville			49.2	12.1		13.31	5.98					
Nasonville	G	69	42.6	13.0	−1.0	12.63	6.53	−1.39	0.50	0.74	−1.89	97
Jamesville			41.6	12.2		11.24	5.62					
Nelson	B	50	51.8	13.7	+5.3	17.54	7.89	−4.32	0.59	0.93	−4.65	99.9+
Jenson			57.1	13.6		13.22	6.26					
Nelson	G	43	44.0	14.4	+6.0	13.50	7.54	−1.49	0.51	1.00	−1.48	93
Jenson			50.0	12.1		12.01	5.01					
Nobleboro	B	33	48.5	13.1	−4.2	13.26	5.01	+4.79	0.52	1.16	+4.12	99.9+
Jonesboro			44.3	15.8		18.05	7.72					
Nobleboro	G	49	37.6	12.0	+1.9	13.01	6.53	−1.31	0.59	0.92	−1.42	92
Jonesboro			39.5	14.6		11.70	7.53					

1. Differences in initial ability in the social studies favor the non-junior school in four out of six cases. These differences vary from less than a half-point to nearly five points, or from two weeks to five months of subject age.
2. The differences in gain in knowledge of the social studies from the seventh to the ninth grade favor the non-junior school in four out of six cases.
3. Only one difference in gain (Nasonville-Jamesville boys) is more than twice its standard error. In this case, a superiority of gain is associated with inferiority in initial status.

Science.—The results obtained in the study of gains in scientific information are given in Table 23.

1. Differences in initial ability in science favor the junior high school member of a paired group in four instances out of six. The initial differences vary from one to six points, or from one to six months of subject age.
2. Differences in gain in science information favor the non-junior school in five out of six cases.
3. Two of the differences in gain are more than twice their standard errors. In one case (Nelson-Jenson boys) the non-junior school shows the greater gain; in the other (Nobleboro-Jonesboro boys) the junior high school is superior. In both instances superiority in gain is associated with marked inferiority in initial status.

Interpretation of Results in Social Studies and Science.—The results of testing in social studies and science yield little of positive value. Only three out of twelve differences in gain were found to be substantial. Two of these substantial differences favored the non-junior school and one the junior high school. In each instance that member of the paired group which had the lower initial ability gained the most during Grade 7 to Grade 9. In view of these facts and the further fact that the school systems were not well selected from the standpoint of a valid study of gains in social studies and science, the conclusion is inevitably negative.

CHAPTER XI

CONCLUSIONS: THE SIGNIFICANCE OF THE INVESTIGATION

THIS study has attempted to answer the question: what has been the effect of reducing the time allotted to fundamentals, which is characteristic of junior high schools in contrast to unreorganized schools, upon gains in achievement in these fundamentals from the seventh to the ninth grade? To answer this question, three pairs of comparable school systems were selected such that the junior high school member of a pair devoted less time to direct instruction in the fundamentals than the non-junior member. Within each pair of systems, groups of boys and girls were paired on the basis of chronological age, intelligence quotient, and educational age at the beginning of the seventh grade. These paired groups were tested by the *Stanford Achievement Test* in the seventh grade and again near the conclusion of the ninth grade to determine the gains in achievement during the intervening period. The differences in gains made by paired groups were studied to discover their significance.

Summary of the Findings.—The results of the study have been presented in detail in preceding chapters. In this chapter, these results are brought together in summary form so that the reader may examine them as a whole. In Table 24, the differences in gain are given in terms of their critical ratios. Wherever the difference in gain favored the non-junior member of a paired group, the critical ratio is placed in the column entitled "Non-Junior." If the junior high school member of a group gained more than its non-junior pair, the critical ratio appears in the column headed "Junior High." A critical ratio of 2.00 or more has been regarded as indicating a substantial difference, since the chances are at least 98 out of 100 that the obtained difference is in the direction of the true difference.

The summarized findings are these:

1. In none of the functions measured does the difference in gain favor consistently either the non-junior school or the junior high school.
2. In each of the functions measured at least one of the six paired groups shows a substantial difference in gain.
3. In the detailed aspects of achievement, twenty-four of the sixty-six differences in gain are substantial.
4. Of the twenty-four substantial differences, twelve favor the non-junior school, and twelve the junior high school.
5. Of the twenty-four substantial differences, eleven are found in paired groups of boys, thirteen in paired groups of girls.
6. In eighteen of the twenty-four substantial differences, superiority in gain is associated with inferiority in initial ability.
7. In total achievement, two out of six paired groups show substantial differences in gain—one in favor of the non-junior school, the other in favor of the junior high school.

Conclusions.—The major conclusion to which this investigation points is that neither type of school has demonstrated its superiority over the other in furthering gains in achievement in fundamentals. This conclusion appears to be valid whether one considers achievement as a whole or in terms of the detailed functions which contribute to total achievement. A corollary to this general conclusion is that sex differences are unimportant factors in differentiating the effects of non-junior and junior high schools on achievement in fundamentals. When the fact of the difference in emphasis on fundamentals is taken into account, it appears that the junior high school is justified in its assumption that by allotting less time than the unreorganized school to the the subjects of reading, language, and arithmetic as such, it has not hampered the growth of pupils in their mastery of these fundamentals.

The Significance of the Study.—These conclusions have an important bearing on the development of the educational program of the seventh, eighth, and ninth grades. If the conclusions are granted for the school systems selected for this investigation, and if it is proper to infer that these findings would be supported by similar studies of reorgan-

TABLE 24

SHOWING FOR EACH OF THE PAIRED GROUPS THE MAGNITUDE AND DIRECTION OF THE CRITICAL RATIOS FOR DIFFERENCES IN GAIN IN ACHIEVEMENT FROM GRADES 7 TO 9. (CRITICAL RATIOS OF 2.00 OR MORE ARE IN BOLD-FACED TYPE)

	Boys		Girls	
	Non-Junior	Junior High	Non-Junior	Junior High
Word Meaning				
Nasonville-Jamesville		1.50	**2.95**	
Nelson-Jenson		1.62	0.60	
Nobleboro-Jonesboro	1.10		**3.71**	
Sentence Meaning				
Nasonville-Jamesville	0.85		0.52	
Nelson-Jenson	0.76			**2.53**
Nobleboro-Jonesboro	1.41		0.91	
Paragraph Meaning				
Nasonville-Jamesville		1.09	0.85	
Nelson-Jenson		**2.92**		**2.40**
Nobleboro-Jonesboro	0.05		0.56	
Reading Total				
Nasonville-Jamesville		0.01	**2.48**	
Nelson-Jenson		1.73		**3.17**
Nobleboro-Jonesboro	**2.30**		**2.01**	
Language Usage				
Nasonville-Jamesville		0.92		0.11
Nelson-Jenson		1.94		1.10
Nobleboro-Jonesboro	**2.70**		1.31	
Spelling				
Nasonville-Jamesville	**2.24**		**2.61**	
Nelson-Jenson		**2.45**		**2.00**
Nobleboro-Jonesboro	**3.97**		**4.75**	

TABLE 24 (cont.)

	Boys		Girls	
	Non-Junior	Junior High	Non-Junior	Junior High
Arithmetic Computation				
Nasonville-Jamesville		0.30	1.82	
Nelson-Jenson		1.79		0.41
Nobleboro-Jonesboro		0.16		**2.34**
Arithmetic Reasoning				
Nasonville-Jamesville		0.64	1.41	
Nelson-Jenson		**2.37**	0.36	
Nobleboro-Jonesboro		1.81		**2.53**
Arithmetic Total				
Nasonville-Jamesville		0.57	1.74	
Nelson-Jenson		**3.67**		0.08
Nobleboro-Jonesboro		1.25		**3.58**
Social Studies				
Nasonville-Jamesville	**2.14**		1.55	
Nelson-Jenson	0.44			1.78
Nobleboro-Jonesboro		0.44	1.08	
Science				
Nasonville-Jamesville	1.71		1.89	
Nelson-Jenson	**4.65**		1.48	
Nobleboro-Jonesboro		**4.12**	1.42	
Total Achievement				
Nasonville-Jamesville	1.62		**4.86**	
Nelson-Jenson		**2.00**		1.06
Nobleboro-Jonesboro	1.31		1.01	

ized and unreorganized schools throughout the nation, it is pertinent to raise certain other questions concerning the appropriate emphasis on fundamentals in these grades. Are the present standards of achievement in fundamentals at the ninth-grade level sufficiently high? If so, could these same standards be maintained with even less specific attention than the junior high school is accustomed to accord them? If present standards are not high enough, by what procedures can these higher standards be attained?

The present investigation provides no direct evidence on these questions. The findings indicate only that there is no relative superiority of the junior high school or the non-junior school in achieving existing standards. The conclusions of the study should prove of value, nevertheless, in denying the claim that a reversion to the practices of the traditionally organized school is essential if higher standards are to be secured. If it be granted, for the sake of argument, that higher levels of achievement in reading, language, and arithmetic are essential to the well-being of the individual and the state, it is doubtful, in view of the findings of this investigation, if these higher standards could be attained by increasing the amounts of time allotted to fundamentals. A more promising approach to higher standards of accomplishment in the fundamentals is probably to be sought through individualized instruction in the grades below the ninth. Whether the individualized methods will produce greater gains than the group methods commonly practised can only be determined by quantitative study.

Closely related to the issue on which this investigation bears is the question of the relative achievements of non-junior and junior high schools in fields other than reading, language, and arithmetic. The junior high school to a greater degree than the unreorganized school has sought to increase the scope of general education at this level. It has enriched the program of studies through the introduction of presumably more vital content of a social and scientific nature; it has broadened the scope of its instruction in mathematics; it has made an earlier beginning on foreign-language study; it has enlarged the opportunities for parti-

cipation in art and music, in the manual, domestic, and commercial arts, and in physical activities. This enrichment has been undertaken not only in the interest of promoting the general welfare of the individual in present-day civilization, but also in the interest of ensuring wiser educational and vocational decisions. The expansion of the educational offering has been made possible through a reduction of the time devoted to the fundamentals. In what degree has the junior high school achieved success in meeting these aims? Are ninth-grade pupils in junior high schools better informed than first-year pupils in four-year high schools? Do they possess more desirable social attitudes? Are they in better health, both physically and emotionally? Are they more qualified to exercise good judgment in the selection of educational and vocational careers? These are some of the questions which must be answered before it can be stated with assurance that the junior high school is more successful than the unreorganized school in the phases of achievement other than the fundamentals.

APPENDIX

Programs of Study of the Selected School Systems

NASONVILLE PUBLIC SCHOOLS

PROGRAM OF STUDIES FOR GRADES 7, 8, AND 9

(Rearranged in terms of constants and variables)

ELEMENTARY SCHOOLS				HIGH SCHOOLS	
Grade 7	Minutes per Week	Grade 8	Minutes per Week	Grade 9	Periods per Week
Constants		*Constants*		*Constants*	
Reading	100	Reading	100	English	5
Spelling	75	Spelling	75	Physical Training	2
Composition	120	Composition	120	*Variables*	
Grammar	80	Grammar	80	Civics (2½) and Ancient History (2½)	5
Arithmetic	160	Arithmetic	160	Civics	5
Geography	120	Geography	120	History	2½
History and Civics	160	History and Civics	160	General Science	5
Penmanship	60	Penmanship	60	Algebra	5
Physiology and Nature Study	30	Physiology and Nature Study	30	Latin	5
Music	75	Music	75	French	5
Drawing	80	Drawing	80	Spanish	5
Elementary Science	60	Elementary Science	60	Drawing	2 or 5
Manual Training or Cooking and Sewing	90	Manual Training or Cooking and Sewing	90	Carpentry	5
Physical Education	—	Physical Education	—	Printing	5
Variables		*Variables*		Elementary Machine	5
None		None		Cooking	3 or 5
				Sewing	2
				Junior Business Training	5
				Chorus Music	1
				Orchestra	1
				(Variables selected by Curricula)	

JAMESVILLE PUBLIC SCHOOLS

PROGRAM OF STUDIES FOR THE JUNIOR HIGH SCHOOLS

(Rearranged in terms of constants and variables)

Grade 7	Periods per Week	Grade 8	Periods per Week	Grade 9	Periods per Week
Constants		*Constants*		*Constants*	
English	3	English	3	English	5
Arithmetic	3	Arithmetic	3	Community Civics	1
History and Geography	3	History and Geography	3	Music	1
Hygiene	1	Hygiene	1	Physical Training	—
Music	1	Music	1	*Variables*	
Spelling	1	Spelling	1	Algebra	5
Writing	1	Writing	1	Mathematics	4
Drawing	1	Drawing	1	Ancient History	3
Shop Work or Cooking and Sewing	2	Shop Work or Cooking and Sewing	2	Latin	5
Physical Training	—	Physical Training	—	French	5
Variables		*Variables*		German	5
Latin	4	Latin	4	Spanish	5
French	4	French	4	Freehand Drawing	1
German	4	German	4	Mechanical Drawing	1 or 2
Spanish	4	Spanish	4	Manual Training	2, 5, or 6
Special Manual Arts	4	Special Manual Arts	4	Household Arts	3, 5, or 7
Special Household Arts	4	Special Household Arts	4	Special Household Arts	12
Typewriting and Commercial Principles	4	Typewriting and Commercial Principles	4	Bookkeeping	5
Elementary Subjects (Special)	4	Elementary Subjects (Special)	4	Typewriting	2
(One Variable to be selected)		(One Variable to be selected)		Penmanship	1
				(Variables selected by Groups)	

Length of Class Period, 60 minutes.

NELSON PUBLIC SCHOOLS

PROGRAM OF STUDIES FOR GRADES 7, 8, AND 9

(Rearranged in terms of constants and variables)

ELEMENTARY SCHOOLS				HIGH SCHOOL	
Grade 7	Minutes per Week	Grade 8	Minutes per Week	Grade 9	Periods per Week
Constants		*Constants*		*Constants*	
Language and Composition	250	Language and Composition	250	English	5
Spelling	100	Spelling	100	Physical Training (for girls)	2
Reading and Literature	170	Reading and Literature	170	*Variables*	
Arithmetic	240	Arithmetic	240	Community Civics	3
History	120	History	120	Ancient History	5
Geography	120	Geography	120	American History and Government	5
Hygiene	45	Hygiene	45	General Science	4
Penmanship	60	Penmanship	60	Biology	5
Drawing	75	Drawing	60	General Mathematics	3 or 4
Music	75	Music	60	Algebra	5
Sewing	60	Sewing	60	Shop Mathematics	4
Variables		*Variables*		Latin	5
None		None		Freehand Drawing	2
				Mechanical Drawing	4
				Shop Sketching	2
				Manual Training	4
				Cookery	4
				Sewing	4
				Chorus Music	1
				Glee Club	1
				Band	1
				Orchestra	1
				Military Drill (for boys)	2
				(Variables selected by Curricula)	

JENSON PUBLIC SCHOOLS

PROGRAM OF STUDIES FOR THE JUNIOR HIGH SCHOOLS

(Rearranged in terms of constants and variables)

Grade 7	Periods per Week	Grade 8	Periods per Week	Grade 9	Periods per Week
Constants		*Constants*		*Constants*	
English Expression and Literature	5	English Expression and Literature	5	English Expression and Literature	5
Mathematics	5	Mathematics	4	Civics and Science	5
Social Studies	5	Social Studies	5	Drawing	1
General Science	3	General Science	3	Music	1
Shop or Home Economics	2	Shop or Home Economics	2	Physical Education	2
Drawing	1	Drawing	1	*Variables*	
Music	2	Music	1	Mathematics	5
Library Instruction	1	Library Instruction	1	Foreign Language	5
Physical Education	2	Physical Education	2	Business Practice	5
Variables		*Variables*		Typewriting	5
None		General Language	4	Shop or Home Economics	4
		Junior Business Training	4	(Variables selected by Groups)	
		Additional Shop or Home Economics	4		
		(One Variable to be selected)			

Length of Class Period, 50 minutes.

NOBLEBORO PUBLIC SCHOOLS

PROGRAM OF STUDIES FOR GRADES 7, 8, AND 9

(Rearranged in terms of constants and variables)

ELEMENTARY SCHOOLS				HIGH SCHOOL	
Grade 7	Minutes per Week	Grade 8	Minutes per Week	Grade 9	Periods per Week
Constants		*Constants*		*Constants*	
Reading and Literature	90	Reading and Literature	90	English	4 or 5
Language and Composition	175	Language and Composition	175	Military Drill or Physical Training	2
Arithmetic	250	Arithmetic	250	*Variables*	
Geography	100	Geography	100	History	4
History and Civics	100	History and Civics	130	Civics	3
Elementary Science	30	Spelling	50	General Science	4
Spelling	50	Penmanship	45	Algebra	5
Penmanship	45	Music	90	Latin	5
Music	90	Drawing	60	Business Arithmetic	5
Drawing	60	Practical Arts	90	Penmanship	2
Practical Arts	90			Freehand Drawing	1
Variables		*Variables*		Mechanical Drawing	2
None		None		Music Appreciation	3
				Chorus Singing	1
				(Variables selected by Curricula)	

JONESBORO PUBLIC SCHOOLS

PROGRAM OF STUDIES FOR THE JUNIOR HIGH SCHOOLS

(Rearranged in terms of constants and variables)

Grade 7	Periods per Week	Grade 8	Periods per Week	Grade 9	Periods per Week
Constants		*Constants*		*Constants*	
English	6	English	5	English	5
Spelling and Penmanship	2	Science	3	Physical Training	2
Social Studies	7	Social Studies	6		
Mathematics	5	Mathematics	4	*Variables*	
Fine Arts	4	Fine Arts	4	Science	5
Practical Arts	2	Physical Training	2	Social Studies	4
Physical Training	2			Ancient History	5
		Variables		Mathematics	5
Variables		Latin (Exploratory)	3	Latin	5
None		French (Exploratory)	3	French	5
		Practical Arts	2 to 5	Fine Arts	3
		Junior Business Training	3	Practical Arts	7
		(One Variable to be selected)		Practical Arts Mathematics	4
				Junior Business Training	5
				(Three of four Variables to be selected)	

Length of Class Period, 40 minutes.

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